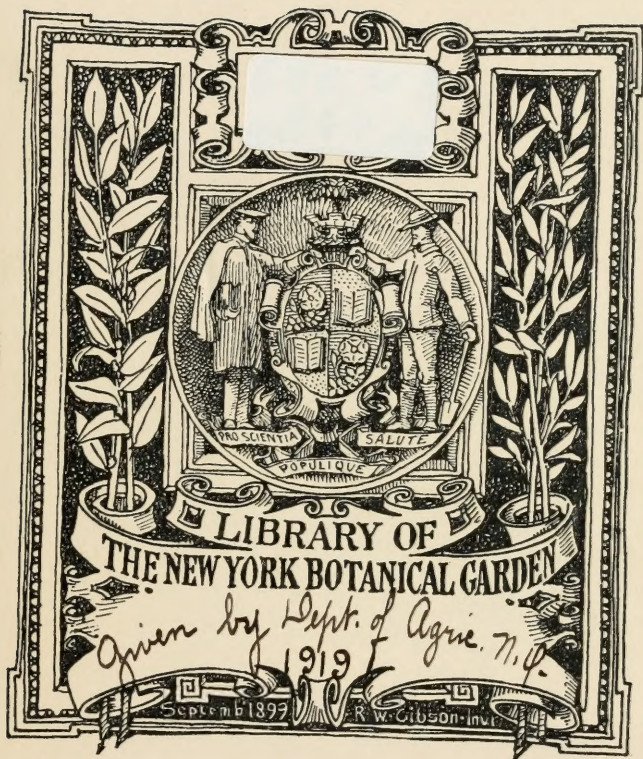




STATE OF NEW YORK

DEPARTMENT OF AGRICULTURE

TWENTY-FIFTH ANNUAL REPORT

OF THE

Department of Agriculture

For the Year Ending September 30, 1917

PART II

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STATE OF NEW YORK

No. 26

IN ASSEMBLY

JANUARY 15, 1918

TWENTY-FIFTH ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

PART II

To the Honorable the Legislature of the State of New York:

In accordance with the provisions of the statutes relating thereto, I have the honor to transmit herewith the Twenty-fifth Annual Report of the Department of Agriculture of the State of New York, for the year ending September 30, 1917.

CHARLES S. WILSON

Commissioner of Agriculture

January 15, 1918.

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STATE OF NEW YORK
DEPARTMENT OF AGRICULTURE

CHARLES S. WILSON, Commissioner

Bulletin 85

Dairy Demonstration Work in New York
State

Prepared by
A. J. NICOLL

Issued by the Bureau of Farmers' Institutes and Compiled under the
Supervision of the Director

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INTRODUCTION

The first publication issued by the State Department of Agriculture on the work of dairy improvement associations was Bulletin 30, issued in 1911 and entitled "Cow Testing Associations." Although at that time the work of such associations was in its infancy, the subject matter set forth in the bulletin was so clear and convincing that it attracted wide attention, making evident the fact that the fundamental principle of profitable dairying was a better cow, intelligently fed. The five years that have passed since Bulletin 30 was issued have been evolutionary, as the title of the present bulletin would indicate. Substantial growth has taken place, showing the possibilities to be attained by better breeding, increased yield, and economic feeding, as factors in reducing the cost of production. The numbers of associations and cows under test have increased, and with these have come better methods of organization and administration. This evolution has sent into the discard much that was undertaken in good faith, but found to be unsuitable; with it have gone not a few cows wholly unfit to have a place in twentieth-century dairying. That the number of the unfit may be materially decreased is one object of present-day associations. With their elimination must go certain men, who, either because of ignorance, lack of adaptation to the business, or undesirable farm location, are working under a handicap too heavy to be overcome.

To set in order and record the development of the cow-testing association idea in New York State, and to make widespread the facts as to both its accomplishment and purpose, this bulletin has been prepared. With greater knowledge, better and more intelligently handled machinery, and with better equipped men — with the support of the director of farm bureaus and county farm managers, of the New York State Dairy Association and hundreds of wide-awake dairymen, as well as of members of our own associations — the director of farmers' institutes and his associates feel that in the next decade there should be manifest marked results in solving the problem of profitable dairying. There is no

question but that in the average dairy the margin of profit is too small, but to the careful observer it must be equally apparent that, desirable as it might be from an individual standpoint, the remedy does not lie in an arbitrarily increased price without regard to the law of supply and demand, but in a better article more economically produced.

Much of the credit for what has been accomplished is due to Mr. A. J. Nicoll, through whose efforts this bulletin has been prepared, and to Mr. John A. Ennis, who together have had charge of the work in the field; also to the many farm bureau managers in whose counties the work has prospered; and within the last year to Mr. H. E. Babcock, assistant director of farm bureaus, to whose untiring efforts and resourceful brain is due the working out of "the dairy improvement association" idea.

With the hope that a careful study of the contents of this bulletin may result in the putting in practice of the principles herein set forth and that thereby the dairymen of the state may be benefited, it is sent forth on its mission.

EDWARD VAN ALSTYNE,

Director of Farmers' Institutes.

EARLY HISTORY OF THE COW-TESTING ASSOCIATION

A. J. NICOLL, Delhi, N. Y.

Farmers' Institute Lecturer

The cow-testing association work in New York State began with the organization of an association by Professor W. A. Stocking at the State College of Agriculture, on May 1, 1908. Such good results were obtained from the work at Ithaca that the dairymen in other localities began to be interested. Four of the herds entering the Ithaca association at its organization showed for the first four years the following increases in profit over feed for each cow:

YEAR	Herd 1	Herd 2	Herd 3	Herd 4
First.....	\$18 04	\$38 04	\$22 86	\$13 36
Second.....	44 63	41 71	33 66	19 62
Third.....	36 02	48 32	57 40	50 59
Fourth.....	40 81	54 84	46 59	51 73

The following extract is taken from the last report of the above association: "We have six members of this association who have been in the entire time which this association has been running. These men have received considerable benefit from this work, as their production per cow has increased from 65 to 70 pounds of fat per cow per year. It has also been of benefit to the entire community in raising calves from cows which were producing a larger amount of fat."

The second association was organized at Delhi, Delaware county, New York, on February 26, 1910, and is still in active operation. Field work was begun on April 1, 1910, with Mr. Roy Cornell as official tester. According to the books of the creameries, during the first year of existence of this association, sixteen herds did actually deliver 270,179 pounds more milk; and

had they been paid at the same price per hundredweight as the previous year, would have received \$4,839 more for the milk of a smaller number of cows. The price at the creameries, however, was considerably higher in 1910-11 than in 1909-10. The complete record is set forth in the following table:

NUMBER HERD	CREAMERY DELIVERIES OF MILK				MONEY PAID IN CHECKS			
	April, 1909-March, 1910		Association year April, 1910-March, 1911		Increase for association year Pounds	April, 1909-March, 1910	Association year April, 1910-March, 1911	Increase for association year
	Number cows	Pounds	Number cows	Pounds				
1.....	16	80,441	16	103,143	22,702	\$1,402 90	\$2,070 29	\$667 39
2.....	35	184,236	35	193,470	9,234	4,201 50	4,676 67	475 17
3.....	25	129,364	25	135,578	6,214	2,312 37	2,762 68	450 31
4.....	34	174,062	34	173,296	†766	2,946 02	2,931 86	†14 16
5.....	42	*77,202	42	*95,445	*18,243	*1,632 32	*2,037 37	*405 05
6.....	25	*56,040	25	*59,843	*3,803	*1,109 96	*1,285 64	*175 68
7.....	37	129,070	37	188,337	59,267	2,056 59	3,187 40	1,130 81
8.....	28	119,310	28	138,167	18,857	1,985 19	2,632 19	647 00
9.....	34	139,071	34	149,527	10,456	2,384 08	2,889 24	505 16
10.....	30	133,118	30	131,093	12,025	2,197 12	2,592 48	395 36
11.....	25	74,646	25	93,837	19,241	1,192 83	1,666 90	474 07
12.....	60	250,290	60	296,024	45,734	4,430 66	5,593 44	1,162 78
13.....	24	96,739	18	95,305	†1,434	1,576 23	1,728 31	152 08
14.....	40	206,922	40	207,281	359	3,732 68	3,932 30	199 62
15.....	36	139,071	36	127,820	†11,251	2,384 08	2,370 43	†13 65
16.....	45	163,859	50	235,404	71,545	3,031 79	4,703 62	1,671 83
Total.....	536	2,153,441	535	2,423,620	270,179	\$38,576 32	\$47,060 82	\$8,484 50

* Six months

† Loss.

In the table below is shown the average increase in production of milk and butter fat per cow in one of the herds in the Delhi association, the average decrease in the cost of feed, and the net average increase in profit per cow over feed, extending over a period of three years:

YEAR	Number cows	Pounds milk	Pounds fat	Value of product	Cost of feed	Profit over feed
1911.....	38	4,716	229	\$75 66	\$43 49	\$32 17
1912.....	39	4,905	239	91 42	35 72	55 70
1913.....	36	5,914	296	115 37	38 64	76 73

The cost of feed was reduced \$4.85 for each cow, and the profit over feed increased \$44.56 in the three years.

One of the herds in the Delhi association during its first years was the pure-bred Holstein herd of Walter L. Terry, of Walton, New York. The record of this herd shows the advantage of membership in a cow-testing association in breeding for production and in selling surplus stock when the yearly records are known for the entire herd. Mr. Terry has since died, but this herd is still included in the association. The record for the entire herd was as follows:

YEAR	Number cows	Pounds milk	Pounds fat	Value of milk	Value of stock sold	Cost of feed	Profit over feed
1911.....	32	220,810	8,583	\$3,488 79	\$2,300 00	\$1,523 12	\$4,265 67
1912.....	36	271,526	9,911	4,354 31	3,150 00	2,113 57	5,390 74
1913.....	61	359,372	12,720	6,038 35	5,000 00	3,165 94	7,872 41

The following statistics indicate the average record for each cow in the herd:

YEAR	Pounds milk	Pounds fat	Value of milk	Value of stock sold	Cost of feed	Profit over feed
1911.....	6,900	268	\$109 02	\$190 24	\$64 50	\$234 76
1912.....	7,542	275	120 95	217 16	86 79	251 32
1913.....	5,891	209	98 99	203 36	85 35	217 00

The lower average profit over feed in 1913 was due to the sale of some high-producing cows and to the fact that there was a large number of heifers in the herd.

Mr. Terry once made the statement: "I believe that every

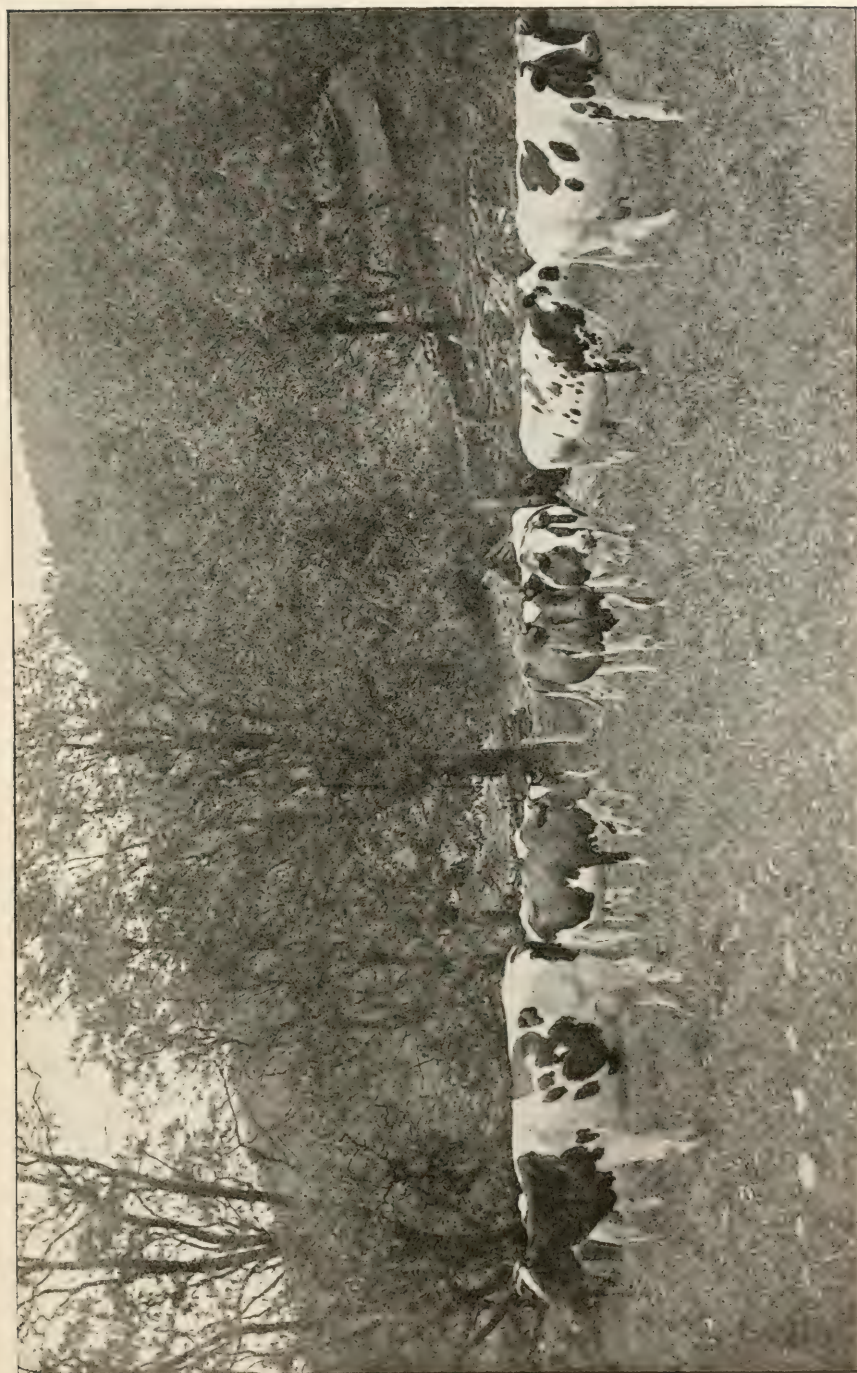


FIG. 544.—HERD OF W. L. TERRY, WALTON, DELAWARE COUNTY. PURE-BRED HOLSTEIN CATTLE IN THE DELHI DAIRY IMPROVEMENT ASSOCIATION

farmer should put scales and a Babcock tester into his barn, and that the best means of conducting and keeping records of a herd is through a cow-testing association."

Two other associations were organized in the year 1910—one at Madrid, in St. Lawrence County, and another at Trout Creek, in Delaware County. During the year 1911 the following associations were formed: March 18, 1911, the Cannonsville Association, in Delaware County; March 28, the Conewango Association, in Chautauqua County; March 30, the Massena Association, in St. Lawrence County; April 5, the Bovina Association, in Delaware County. These, together with the original association at Ithaca, made a total of eight organizations at the end of the year 1911.

The success of the work up to this time was due largely to the effort of Dr. Raymond A. Pearson, who was then commissioner of agriculture. Most of the work of organization was done by A. J. Nicoll, of Delhi, who prepared Bulletin 30 on cow-testing work, issued by this department in December, 1911.

During the year 1912 new associations were formed in Cattaraugus, Oneida, Otsego, Jefferson, and Delaware counties, making a total of thirteen organizations at the close of the year. Eleven herds in the Jefferson County association continued the work for three years, and the results obtained are shown in the following table:

No. Herd	Pounds milk				Pounds fat			
	Average per cow first year	Average per cow third year	Increase in three years	Decrease in three years	Average per cow first year	Average per cow third year	Increase in three years	Decrease in three years
1.....	6,085	6,868	783	.....	226.9	247.9	21.0	.....
2.....	6,208	6,465	257	.....	188.7	230.2	41.5	.....
3.....	6,141	6,111	.....	30	216.8	226.1	9.3	.....
4.....	7,236	7,777	541	.....	258.3	279.2	20.9	.....
5.....	7,210	7,117	.....	93	281.9	265.5	.....	16.4
6.....	5,553	5,838	285	.....	202.1	218.3	16.2	.....
7.....	7,467	9,330	1,863	.....	259.1	323.6	64.5	.....
8.....	9,805	8,200	.....	1,605	338.3	298.1	.....	40.2
9.....	7,606	8,662	1,056	.....	248.0	317.0	69.0	.....
10.....	6,799	7,920	1,121	.....	261.8	285.1	23.3	.....
11.....	4,927	7,754	2,827	.....	*	.....	.....	.....

* No butter fat record first year.

The total gain in milk in the eleven herds was 75,969 pounds, having a value of \$1,146.37. The butter-fat production was increased over 4,000 pounds.

In 1913, Commissioner of Agriculture Calvin J. Huson placed the cow-testing association work in charge of Edward van Alstyne, director of farmers' institutes. Special effort was made at the farmers' institute meetings to set forth the value of cow-testing associations, showing the good results obtained by the associations in increasing the production of milk and butter fat for each cow and in lowering the cost of feed consumed. Largely as a result of this instruction, thirteen associations were organized during the year.

Previous to the year 1913, all associations had been organized on the "per cow" plan, the usual rate being one dollar for each cow. This proved very unsatisfactory. Since the official tester spent the same length of time at each farm, the owners of the larger herds felt that they were paying too much. Many cows were sold and the owners did not wish to pay for testing cows that they did not own. As the price demanded by the official tester increased from thirty-five to forty dollars a month in the first years to the present prices of from forty-five to fifty dollars a month, the assessment of one dollar a cow was not sufficient to meet the expenses. Some of the dairymen who had pure-bred cows wished to do official work in their respective herds, and the "per cow" plan did not seem to fill this need. During the year 1912, the Delhi association changed to the per diem plan, charging each member two dollars a day for the time he employed the official tester, regardless of the number of cows tested. In the larger herds the official tester is employed for two days a month. Occasionally, if two small herds are on adjoining farms, the tester can care for both in one day, each man paying one dollar. This plan worked so well that it was advocated at the farmers' institutes of 1912-13, with the result that the associations formed since January, 1913, have been on the per diem plan, each member paying the tester for the time he is employed at the rate of two dollars a day. A small assessment is made on the members in order to pay incidental expenses.

All of the associations that were organized on the "per cow" plan either have adopted the per diem plan or have been discontinued. With the year 1914 came an increased interest in the cow-testing association work in this state. Despite the loss of eleven associations during the year, caused largely by the severe and widespread outbreak of foot-and-mouth disease, the year closed June 14, 1915, with a total of thirty-seven active associations, with 930 members and 19,963 cows, or nearly one-fourth of all the cow-testing associations in the entire United States at that time. These results were made possible by the active cooperation of the farm bureau managers of the state.

With the increased demand for men as official testers, there came a need for special training in the work. During the winter of 1914-15, John A. Ennis, a dairy expert from the Bureau of Farmers' Institutes, gave a course of training to a class of young men at the State School of Agriculture, Alfred, New York; special instruction was also given in the same work by Director F. G. Helyar at the State School of Agriculture, Morrisville, New York. The same plan for training was followed at both of these schools during the past winter, and next year a similar course will be given in the State School of Agriculture at Delhi.

The plan has been to hold those associations already formed to a high standard of efficiency by a full membership, a high grade of men in charge of the work, and a more careful tabulation of data gathered. At the normal institute for state institute workers and county farm bureau managers, held at the State College of Agriculture in Ithaca, November 10, 1915, Director Edward van Alstyne presented a paper on "Suggestions for Broadening and Making More Effective the Work of Cow-Testing Associations," which brought out discussion that led to the formation of a plan for better cooperation between the farm bureau managers and the Bureau of Farmers' Institutes, in conducting the cow-testing association work (see pp. 2206-2217). This plan has been further developed during the year by the efficient work of H. E. Babcock, assistant to the state director of farm bureaus, in cooperation with the Bureau of Farmers' Institutes, and is presented on pp. 2202-2205 under the title, "Plans for the Future."

During the past year 15 new associations have been organized, and 7 discontinued, making a total of 45 in active operation

on June 30, 1916, with 1,114 members and 23,468 cows. Several pure-bred Jersey cows have been on official test in the associations during the year. To show the high grade of the work that is being done, we give below an extract from a letter written by the secretary of the American Jersey Cattle Club to a member of one of our cow-testing associations:

NEW YORK, *October 27, 1915.*

DEAR SIR — In regard to your joining the testing association in your county, I would state that we will verify and vouch for the work of the supervisors of cow-testing associations. We consider work done under the supervision of cow-testing associations on a par with that done by the state experiment stations, and make no distinction between the two records.

Very truly yours,

AMERICAN JERSEY CATTLE CLUB

(Signed) R. M. Gow.

The following list shows the associations in operation, June 30, 1916. During nearly the whole of the past year, however, an additional association — Chaffee-Sardinia, Erie County — has been operating. On completing the year, June 1, 1916, the association was disorganized and several of the members joined the Java-Chaffee association in Wyoming County.

NEW YORK STATE DAIRY IMPROVEMENT ASSOCIATIONS

County and association	Date began work	President	Dairy demonstration agent
BROOME:			
Lisle	July 1, 1915	Frank Arnold, Whitney Point.....	Robert Bodin, Killawog.
Susquehanna Valley	Nov. 11, 1914	A. B. Griffin, Susquehanna, Pa., R. 6.	Earl Love, care A. B. Griffin.
CATTARAUGUS:			
Conewango Valley	April 1, 1915	Glenn W. Hall, Dayton.....	Newell J. Brown, Cuba.
Ischua Valley	April 1, 1912	E. B. Farwell, Ischua.....	Paul L. Green, Hornell.
CHAUTAUQUA:			
Carroll	April 1, 1911	F. J. Halliday, Jamestown, R. 82.....	Ernest Engdahl, Sinclairville.
CHEMUNG:			
Northern Chemung.....	April 16, 1914	Oscar Kahler, Elmira.....	J. A. Birkland, care H. Shriver, R. 1, Corning.
CHENANGO:			
New Berlin.....	May 1, 1915	G. B. Low, New Berlin.....	Wm. E. Day, New Berlin.
North Chenango.....	Nov. 8, 1915	H. P. Smith, Smyrna.....	Ray Taylor, Smyrna.
West Chenango.....	Mar. 7, 1915	Robert Marshman, Oxford, R. 4.....	Glenn Carter, Norwich.
CORTLAND:			
Cortland Co. Central.....	June 17, 1914	Homer H. Jones, Homer, R. D.....	G. A. Burdick, care Farm Bureau.
Cortland Co. South.....	June 11, 1914	Richard Phalen, Marathon, R. 3.....	Mr. Coke.
DELAWARE:			
Cannonsville & Deposit.....	April 1, 1911	Henry Alexander, Kelsey.....	Chauncey Hoag, Deposit.
Delhi-Bovina.....	May 1, 1911	A. J. Nicoli, Delhi.....	James Calhoun, Andes.
Roxbury.....	Nov. 1, 1912	Bruce Mead, Roxbury.....	C. W. Kroneck, Roxbury.
Treadwell.....	April 27, 1916	H. A. Gladstone, Treadwell.....	A. Burton Smith, Treadwell.

DAIRY IMPROVEMENT ASSOCIATIONS — (Continued)

County and association	Date began work	President	Dairy demonstration agent
STEBEN: Cohocton Valley.....	Feb. 18, 1916	Lee Shults, Avoca, R. D.....	John R. Allen, Bath.
SULLIVAN: Liberty.....	Dec. 5, 1915	Wm. R. Crary, Liberty.....	Arthur A. Booth, Liberty
TIOGA: First Tioga.....	Jan. 1, 1916	L. H. Leonard, Owego.....	Jas. H. Ball, Newark Valley.
TOMPKINS: Ithaca (Cornell).....	May 1, 1908	Dept. of Dairy Industry, Cornell Univ..	Wayne Dingman, Ithaca, R. 1.
ULSTER: Walkill.....	Dec. 1, 1914	Fred Du Bois, New Paltz.....	Wm. J. Wilcox, Amity.
WASHINGTON: Cambridge Valley..... Hartford-Hebron.....	June —, 1916 April 24, 1913	Geo. E. McGeech, Cambridge..... W. W. Norton, Hartford.....	W. W. Jackson, Cambridge. Kendrick Chase, Hartford.
WYOMING: Attica..... Java-Chaffee..... Perry-Pike..... Warsaw..... Wethersfield.....	Nov. 1, 1914 July 1, 1914 June 1, 1913 July 14, 1914 June 22, 1915	C. H. Waite, Attica..... A. E. Nichols, Java..... John L. Fuller, Castile..... H. W. Avery, Warsaw..... Louis J. Zeches.....	R. Daggett, Attica. Scott Warren, Johnsonburg. Chas. T. Hunt, Pike. Milo Davis, Warsaw. Harold B. Stout, Bliss.

NOTE.—The above list includes several associations that were organized under the name "cow-testing associations," and have not been reorganized since the new plans went into effect.

NEED OF DAIRY IMPROVEMENT ASSOCIATION WORK IN NEW YORK STATE

A. J. NICOLL, Delhi, N. Y.

Farmers' Institute Lecturer

According to the census of 1900, the 1,501,608 dairy cows in New York State produced an average of 4,378 pounds of milk for each cow. The 1910 census reported 1,509,594 cows, with an average production of 4,410 pounds of milk, or a gain of only 32 pounds for each cow in the ten years. In thirty-two of the counties, the average production for each cow was less in 1910 than in 1900. In seven of the counties the decrease was over 1,000 pounds of milk for each cow, according to Circular 17 of the State College of Agriculture. While the production of the average cow does not seem to be increasing as it should, the cost of production has been going up very rapidly. Few dairymen realize that the cost of producing milk in New York State has about doubled in the last fifteen years. Yet if we look at some of the items that enter into the cost of production we shall see that this is true.

INVESTMENT IN DAIRY CATTLE

A herd of dairy cattle consists of cows, yearling heifers, heifer calves, and herd bull. At the present time the investment in a dairy herd is twice as much, or in other words is 100 per cent higher than it was in the year 1900. If the value of dairy cattle has increased 100 per cent within fifteen years, the depreciation has been increased in proportion; for cattle grow old, become diseased, and die, just as they did when they cost only half as much as they do now.

The roughage consumed by the dairy herds, based on the value of hay as quoted in the *Rural New Yorker* of October 6, 1900, and October 2, 1915, shows an increase in value of 36 per cent. The grain required by the herd, most of which is purchased, is 50 per cent higher than it was on October 1, 1900, as shown by the following table, which gives the prices of the feeds sold to the

farmers of Delaware County by C. E. Kiff, of Delhi, to be fed to the cows of their dairy herds:

Grain	1900	1915	Increase per ton
Wheat feeds.....	\$20 00	\$33 00	\$13 00
Corn meal.....	21 00	37 00	16 00
Hominy meal.....	19 50	35 00	15 50
Gluten meal.....	22 00	30 00	8 00
Cottonseed meal.....	27 00	35 00	8 00
Ground oats.....	27 00	40 00	13 00
Linseed meal.....	30 00	40 00	10 00

These prices show an average increase of 50 per cent in cost of feed to the farmers within fifteen years.

The labor required on a dairy farm is at least 50 per cent higher than in 1900. At that time a hired man on a Delaware County dairy farm received \$20 and board, while during the last year a man doing no more work cost the farmer \$30 and board. Furthermore, help is harder to find, and, as a rule, is not so satisfactory.

If the investment has increased 100 per cent in fifteen years, and interest and depreciation has increased in proportion; if the roughage consumed by the herd is worth 36 per cent more and the grain 50 per cent more; if the labor that enters into the cost of production has increased in cost as much as grain; and if the average production for each cow in the state is no greater, it is evident that in order for the farmer to have the same profit in the dairy business as he had fifteen years ago, he must receive a higher price for the product placed on the market. While the selling price of dairy products has advanced in the past fifteen years, it has not kept pace with the cost of production.

The following table gives Borden's prices for 3.9 milk at Delhi, for the years beginning October 1, 1900, and October 1, 1915:

	1900	1915	Increase on 100 pounds
April.....	\$1 10	\$1 48	\$ 38
May.....	90	1 23	33
June.....	80	1 17	37
July.....	90	1 43	53
August.....	1 05	1 59	54
September.....	1 25	1 68	43
October.....	1 35	1 87	52
November.....	1 45	1 97	52
December.....	1 50	1 97	47
January.....	1 50	1 87	37
February.....	1 40	1 82	42
March.....	1 30	1 77	47

It will be seen from the above table that the increase in the price of milk in the fifteen years is 37 per cent, which is much less than the increase in the value of everything that enters into its production; but, with an increased cost of 100 per cent in investment, interest, and depreciation, 50 per cent in grain and labor, and 36 per cent in roughage, a problem presents itself. Despite the increase of 37 per cent in the selling price of dairy products, and allowing, as we must, for the increase in the value of beef and hides, the dairyman still finds himself with a smaller profit than he had from a similar herd on the same farm fifteen years ago.

There are two ways in which the producer of dairy products can increase his profits:

1. They may be increased by an increase in the selling price. The dairyman feels that he is entitled to this, first, because of the great increase in the cost of everything that enters into its production, and, secondly, because milk at its present retail price is much cheaper than any other food of its class that comes on the table of the consumer. A quart of milk is equal to 15 cents' worth of beef at 20 cents a pound, to 23 cents' worth of eggs at 35 cents a dozen, or to 20 cents' worth of oysters at 40 cents a quart. The dairyman, when he considers the value of the food he is placing on the market and its high cost of production, feels that the present selling price is too low; but so long as there is sufficient milk available to supply the market at the present price, no very great increase can be expected.

2. The second way for the dairyman to increase his profit is by a lower cost of production. It is rather strange that farmers when thinking of a greater profit usually expect it to come by way of a higher selling price; in this case they think they are justly entitled to a higher price, but are so intently watching the market end of the business that they forget that the same result can often be obtained by lowering the cost of production. The latter is usually within the farmer's control, while the former is often beyond his reach.

Records made by cow-testing associations show that the average herd is making all its profit from about half the cows; one-fourth of the herd just about pays expenses, while the remaining one-fourth is kept at a loss. All herds have some good cows, usually enough to breed a profitable herd; but the unprofitable

individual is much too common for the good of the dairyman. When we remember that we are not using the dairy cow as Nature intended, we shall not be so much surprised to find the low producer of milk and fat in the herd. Nature intended the cow to produce sufficient milk, containing sufficient fat to sustain her calf until it could obtain its living from the land. This was by no means a large production. A few hundred pounds of milk containing perhaps a rather low percentage of fat was all that was needed, and when the need was filled, the supply ceased. By intelligent selection, breeding, feeding, care, and environment, we have developed the dairy cow from her natural production of sufficient to feed her calf to the splendid performers of the dairy breeds of today, when we are producing from a single cow more than fifteen tons of milk and as much as the body weight of the cow in butter fat in a year; and the records of production are still going up. If we compare present conditions with the condition of the cow as we began with her, we need not be surprised to find the unprofitable individual in all breeds and in most herds where a careful system of selection has not been followed. In order to show the possibilities of selection as a factor in increasing the profits of the herd, we give the record of two herds in an Oneida county association. The first herd of fifteen cows has no unprofitable individuals, while the second herd has a number of the "boarder" variety. The record is as follows:

	RECORD OF ENTIRE HERD		RECORD OF BEST 10 Cows		RECORD OF BEST Cow	
	Herd 1 (15 cows)	Herd 2 (39 cows)	Herd 1	Herd 2	Herd 1	Herd 2
Pounds milk.....	108,288.6	213,355.6	77,011.6	69,397.1	9,478.7	8,739.1
Average per cow....	7,219.2	5,470.6	7,701.1	6,939.7	.....	.....
Pounds fat.....	4,028.6	7,359.8	2,771.0	1,360.9	341.2	296.8
Average per cow....	268.5	188.7	277.1	136.0	.....	.....
Value of product....	\$1,816.55	\$3,070.27	\$1,294.74	\$1,010.25	\$154.85	\$127.66
Average per cow....	121.10	78.72	129.47	101.02	.....	.....
Cost of feed.....	698.27	1,781.73	476.81	465.93	46.96	48.70
Average per cow....	46.55	45.68	47.68	46.59	.....	.....
Labor, depreciation, interest.....	525.00	1,365.00	350.00	350.00	35.00	35.00
Average.....	35.00	35.00	35.00	35.00	.....	.....
Total cost.....	1,223.27	3,146.73	826.81	815.93	81.96	83.70
Average.....	81.55	80.68	82.68	81.59	.....	.....
Profit.....	593.28	.....	467.93	194.32	72.89	43.96
Average.....	39.55	.....	46.79	19.43	.....	.....
Loss.....	.....	76.46	.....	.....	.....	.....
Average.....	.....	1.96	.....	.....	.....	.....
Cost per 100 pounds milk.....	1.12	1.47	1.07	1.17	.86	.95
Cost per quart milk. Return for 1 hour labor.....	0242	0317	0230	0252	0185	0205
	52	17	58	35	81	56

NOTE.— Charge for labor, \$22; and for interest and depreciation, \$13 a cow, for one year.

It should be noticed that after a charge of \$35 a cow for labor, interest, and depreciation has been added to the cost of the feed, Herd 1, with fifteen cows, still makes a profit of \$593.28, or \$39.55 a cow, while Herd 2, with thirty-nine cows, makes a loss of \$76.46, or \$1.96 per cow; yet we find in this herd ten cows with a record showing a net profit of \$194.32, or \$19.43 profit for each cow, while one cow made a profit of \$43.96. Deducting the record of the best ten from each herd, we find the poorest five in Herd 1 making a profit over all expenses of \$125.35, while the poorest 29 in Herd 2 lost to the owner \$270.78. Herd 1 consumed 87 cents' worth more feed for each cow than did Herd 2, while the best cow in Herd 2 ate \$1.74 more feed than the best cow in Herd 1, and made \$28.93 less profit.

One of the main objects in keeping dairy cows is to afford a market for the crops grown on the farm, and for the labor of the farmer and his family. In order to show the different returns given by the different cows in the herd for the hay consumed and the labor expended, as well as the cost of the product, we have selected the records of two herds with a production of milk and fat above the average in their localities. The first is a grade Jersey herd owned in Delaware county, of which the following record was made:

Number of cow	Pounds milk	Pounds fat	Value of product	Cost of feed	Total cost production	Net profit	Loss	Cost of 100 pounds milk	Cost of 1 quart milk	Return for 1 hour labor	Return for 1 ton hay consumed
1.....	6,102.4	279.1	\$109.34	\$50.59	\$85.59	\$23.75	.....	\$1.40	\$ 0.0301	\$0.39	\$20.80
2.....	5,710.0	221.3	92.77	50.19	85.19	7.58	.....	1.49	.0321	.25	13.50
3.....	4,542.8	213.2	78.05	44.74	79.74	.....	\$1.69	1.75	.0377	.17	9.20
4.....	5,201.1	210.8	80.62	45.84	80.84	.....	22	1.55	.0334	.18	9.90
5.....	4,202.2	240.5	88.02	47.29	82.29	5.73	.....	1.95	.0421	.23	12.78
6.....	5,637.3	296.2	110.70	50.18	85.18	25.52	.....	1.51	.0324	.40	21.78
7.....	5,209.4	243.8	95.73	49.75	84.75	10.98	.....	1.62	.0349	.28	15.06
9.....	5,308.0	290.0	109.62	52.41	87.41	22.21	.....	1.64	.0354	.37	20.98
10.....	4,369.3	184.9	66.54	44.60	79.60	.....	13.06	1.82	.0391	.07	3.88
11.....	6,684.0	277.0	109.73	50.82	85.82	23.91	.....	1.28	.0276	.39	21.14
15.....	5,486.0	273.0	99.04	46.41	81.41	17.63	.....	1.48	.0319	.33	18.18
17.....	5,774.0	348.0	133.56	54.65	89.65	43.91	.....	1.55	.0333	.56	30.36
18.....	4,364.7	210.4	82.86	46.43	81.43	1.43	.....	1.86	.0401	.20	10.66
20.....	5,092.3	231.7	99.76	52.29	87.29	12.47	.....	1.71	.0368	.29	15.76
22.....	5,684.5	299.6	108.95	47.07	82.07	26.88	.....	1.44	.0310	.41	22.46
23.....	3,514.3	174.2	68.31	45.01	80.01	.....	11.70	2.27	.0489	.09	4.58
25.....	4,404.0	186.7	70.66	45.42	80.42	.....	9.76	1.82	.0392	.10	5.47
Average..	5,134.5	245.9	94.36	48.45	83.45	10.91	.....	1.62	.0336	.28	15.05

NOTE.—Charge for labor, \$22; for interest and depreciation, \$13 a cow for one year. The return for one hour of labor may be found by subtracting the total cost of feed, depreciation, and interest from the value of product, and dividing the difference by 117, the total number of hours spent in caring for the average cow. The return for each ton of hay consumed may be found by subtracting the total cost of grain, labor, depreciation, and interest from the value of product, and dividing the difference by the quantity of hay consumed by the cow during the year.

It should be noticed that this herd is profitable, giving an average surplus of \$10.91 over all expenses, including labor, depreciation, and interest charge as shown in the preceding table; yet five of the cows were unprofitable, losing \$36.43 for the owner, and returning a small price for each ton of hay they consumed and a low price for the labor spent in caring for them.

The following table shows the result of removing the five unprofitable cows from the above herd, giving the average per cow:

	Pounds milk	Pounds fat	Value of Product	Cost of feed	Total cost production	Net profit	Cost 100 pounds milk	Cost of 1 quart milk	Return for one hour's labor	Return for one ton hay
Entire herd.	5,134.5	245.9	\$94.36	\$48.45	\$83.45	\$10.91	\$1.62	\$.0349	\$0.28	\$15.05
Best 12 cows.	5,437.9	267.5	103.34	49.87	84.87	18.47	1.56	.0335	35	27.32
Poorest 5 cows.	4,407.9	193.9	72.83	45.05	80.05	*7.22	1.81	.0389	13	10.00

* Loss.

The second is a grade Holstein herd of twenty cows, the record of which may be seen in the following table:

No. Cow	Pounds milk	Pounds fat	Value of product	Cost of feed	Total cost production	Profit over all expenses	Loss per cow	Cost 100 pounds milk	Cost one quart milk	Return for one hour's labor	Return for one ton hay consumed
1.	5,802.1	227.8	\$78.15	\$62.56	\$97.56	.....	\$19.41	\$1.68	\$.0361	\$0.02	\$5.64
3.	5,957.4	220.4	86.86	65.48	100.48	.....	13.62	1.68	.0363	07	7.22
4.	5,007.8	158.9	67.78	62.56	97.56	.....	29.78	1.94	.0418	*06	2.12
5.	6,040.4	281.4	89.33	65.48	100.48	.....	11.15	1.66	.0357	09	8.16
8.	6,269.7	220.4	92.46	60.65	95.65	.....	3.19	1.52	.0328	16	11.34
11.	5,328.7	212.0	70.94	62.56	97.56	.....	26.62	1.83	.0393	*04	3.18
12.	4,592.6	181.8	62.55	62.56	97.56	.....	35.01	2.12	.0456	*11	3.34
13.	3,805.5	161.4	50.97	60.38	95.38	.....	44.41	2.50	.0538	*19	*2.84
14.	6,261.0	292.5	107.16	70.43	105.43	\$1.73	.....	1.68	.0362	20	13.46
15.	6,467.8	224.6	90.49	64.90	99.90	.....	9.41	1.54	.0352	10	9.00
16.	9,842.6	341.3	143.18	65.39	100.39	42.79	.....	1.02	.0219	55	31.54
17.	5,967.7	221.8	83.09	66.04	101.04	.....	17.95	1.69	.0364	03	6.14
19.	5,051.2	178.1	66.55	62.56	97.56	.....	31.01	1.93	.0415	*08	1.71
20.	5,610.9	205.0	78.45	66.04	101.04	.....	22.59	1.80	.0387	*005	4.42
21.	8,087.1	340.6	132.42	71.90	106.90	25.52	.....	1.32	.0284	41	23.36
22.	7,479.8	294.6	115.35	69.63	104.63	10.72	.....	1.39	.0300	28	17.20
23.	8,837.9	297.9	140.19	71.90	106.90	33.29	.....	1.21	.0260	47	26.59
24.	6,802.5	309.6	102.81	67.15	102.15	66	.....	1.50	.0322	19	12.76
25.	7,209.6	230.1	102.46	64.69	99.69	2.77	.....	1.38	.0297	21	13.34
26.	4,503.8	154.9	59.75	60.38	95.38	.....	35.63	2.11	.0455	*11	14
Average.	6,246.3	237.7	91.04	65.16	100.16	.....	9.12	1.60	.0328	11	9.06

* Loss.

NOTE.—The return for one hour of labor may be found by subtracting the total cost of feed, depreciation, and interest from the value of product and dividing the difference by 117, the total number of hours spent in caring for the average cow during the year.

The return for each ton of hay consumed may be found by subtracting the total cost of grain, labor, depreciation, and interest from the valuation of product, and dividing the difference by the quantity of hay consumed by the cow during the year.

The average production of each cow was 6,246 pounds of milk and 237.7 pounds of fat, yet the cost of feed was so high that there was a loss of \$9.12 for each cow. Some farmers think that it is better to keep stock enough to eat up the hay, even if the production of each cow is low. It should be noticed that in this herd the best cow paid 55 cents an hour for all time expended, and the market price for hay, or, she paid the labor charge of \$22 a year and paid \$31.54 a ton for her hay, while the poorest cow, No. 13, lost for the owner \$44.41 for the year. She paid him the market price for his hay if he would give her 19 cents an hour for the pleasure of her company, or, she would pay him \$22 for caring for her during the year if he would pay \$2.84 for the privilege of seeing her eat 5885 pounds of hay for which she paid nothing. Seven of this herd paid less than nothing for the labor, and two paid less than 50 cents a ton for the hay consumed.

The following table shows the average record of the above herd with the seven cows that returned less than nothing for labor removed:

	Pounds milk	Pounds fat	Value of product	Cost of feed	Total cost production	Net profit	Cost 100 pounds milk	Cost 1 quart milk	Return for one hour's labor	Return for one ton hay
Entire herd.....	6,246.3	237.7	\$91 04	\$65 16	\$100 16	*\$9 12	\$1 60	\$.0344	\$0 11	\$9 06
Best 13 cows.....	7,002.0	269.4	104 92	66 63	101 63	3 29	1 45	.0312	.21	13 18
Poorest 7 cows....	4,842.9	178.9	65 28	62 43	97 43	*32 15	2 01	.0432	*08	1 33

* Loss.

To show the possibilities of good selection, careful breeding, and economic feeding, we compare two Oneida County herds in the same locality and the same association, from which the milk was sold at the same price. Their record is shown in the following table:

	RECORD OF ENTIRE HERD		RECORD OF BEST 5 COWS		RECORD OF BEST COW	
	Herd 1 (9 cows)	Herd 2 (23 cows)	Herd 1	Herd 2	Herd 1	Herd 2
Pounds milk.....	93,875.2	138,827.0	57,964.3	41,422.7	12,525.3	9,132.3
Average per cow.....	10,430.5	6,035.9	11,592.8	8,284.5	.....	.....
Pounds fat.....	3,112.8	4,574.7	1,952.0	1,282.4	431.5	270.6
Average per cow.....	345.8	198.9	390.4	256.5	.....	.....
Value of product.....	\$1,485.31	\$2,185.64	\$926.29	\$680.20	\$197.92	\$155.41
Average per cow.....	165.03	95.03	185.26	136.04	.....	.....
Cost of feed.....	671.26	1,513.76	378.80	371.75	82.26	95.51
Average per cow.....	74.58	65.81	75.76	74.35	.....	.....
Profit over feed.....	814.05	671.88	547.49	288.45	115.66	59.90
Average per cow.....	90.45	29.21	109.50	57.69	.....	.....
Labor, depreciation and interest.....	315.00	805.00	175.00	175.00	35.00	35.00
Average per cow.....	35.00	35.00	35.00	35.00	.....	.....
Total cost.....	986.26	2,318.76	553.80	566.75	117.26	130.51
Average per cow.....	109.58	100.81	110.76	113.35	.....	.....
Net profit.....	499.05	.....	372.49	133.45	80.66	24.90
Average per cow.....	55.45	.....	74.50	26.69	.....	.....
Net loss.....	.....	133.12	.....	.....	.....	.....
Average per cow.....	.....	5.79	.....	.....	.....	.....
Net cost per 100 pounds milk.....	1.05	1.67	955	1.68	936	1.429
Cost per quart milk.....	0225	0359	0195	0294	0201	0307
Return for 1 hour labor.....	66	14	82	41	87	40

NOTE.—Charge for labor, \$22 per cow; and for interest and depreciation, \$13 per cow, for one year.

The herd of nine cows made a profit over all expenses of \$199.05, while the herd of twenty-three cows lost \$133.12, yet the owner had five cows that made for him a profit of \$133.45. The reader will also notice the difference in the return for labor in the two herds.

After deducting the record of the best five cows in each herd, we have left four cows in Herd 1 and eighteen cows in Herd 2. The following table gives their record:

	Poorest 4 cows in Herd 1	Poorest 18 cows in Herd 2
Pounds milk.....	35,910.9	97,404.3
Average per cow.....	8,977.7	5,411.3
Pounds fat.....	1,160.8	3,292.3
Average per cow.....	290.2	182.9
Value of product.....	\$559.02	\$1,505.44
Average per cow.....	139.75	83.63
Cost of feed.....	292.46	1,142.01
Average per cow.....	73.11	63.44
Profit over feed.....	266.56	383.43
Average per cow.....	66.64	21.30
Labor, depreciation, and interest.....	140.00	630.00
Average per cow.....	35.00	35.00
Total cost of production.....	432.46	1,772.01
Average per cow.....	108.11	98.44
Total profit.....	126.56	.....
Average per cow.....	31.64	.....
Total loss.....	.....	266.57
Average per cow.....	.....	14.81
Cost of 100 pounds milk.....	1.20	1.819
Cost of one quart milk.....	.025	.0391
Return for one hour's labor.....	.45	.06

It will be seen that there is a good profit on the four cows left in Herd 1 and a loss on the eighteen left in Herd 2. Herd 1 is an example of what can be done by a member of a dairy improvement association through a careful selection of the individual on



FIG. 545.—CREAMELLE TOPSY ORMSBY TOBE, 204114, OWNED BY MR. FRED J. BOYSON, ROME, N. Y.

The record made by this cow during the past year is shown in the last column of the table on page 2195.

the basis of her production of milk and butter fat, by good feeding and good care, and by the use of a pure-bred sire of the same breed as the cow, a good individual of the breed, and the son of a better producer of milk and fat than any cow in the herd.

The following table shows a year's record of 4,000 cows in the cow-testing associations of New York, a record of the 78 best herds, the 63 poorest herds, and the best cow in the 4,000 cows, for the year 1915. These figures were taken from records of entire associations as they came to hand, without reference to breed or locality.

	Record of 263 herds, with 4,000 cows	Record of best 72 herds, with 1,018 cows	Record of poorest 63 herds, with 1,008 cows	Record of best cow in the 4,000
Pounds of milk.....	26,597,113	7,374,309	5,196,019	.....
Average per cow.....	6,649.2	7,243.9	5,154.7	25,108.9
Pounds of fat.....	970,336	293,023	193,498	.....
Average per cow.....	242.5	287.8	191.9	749.7
Value of product.....	\$389,734 04	\$123,854 09	\$72,124 59	.....
Average per cow.....	\$97 43	\$121 66	\$71 55	\$424 60
Pounds hay consumed.....	9,857,749	2,229,236	2,651,092	.....
Average per cow.....	2,464	2,189	2,630	1,546
Pounds silage.....	17,058,711	5,258,125	3,712,057	.....
Average per cow.....	4,264	5,156	3,682	7,600
Pounds grain.....	5,748,104	1,756,145	1,122,683	.....
Average per cow.....	1,437	1,723	1,113	5,573
Cost of roughage.....	\$115,237 33	\$29,536 44	\$45,040 27	.....
Average per cow.....	\$28 80	\$29 09	\$44 68	\$30 11
Cost of grain.....	\$85,753 68	\$25,790 62	\$17,844 82	.....
Average per cow.....	\$21 43	\$25 33	\$17 70	\$97 66
Total cost of feed.....	\$200,991 01	\$55,727 06	\$62,885 09	.....
Average per cow.....	\$50 24	\$54 34	\$62 38	\$126 77
Labor, depreciation, and interest cost per cow.....	\$35 00	\$35 00	\$35 00	\$35 00
Total cost of production per cow.....	\$85 24	\$89 34	\$97 38	\$161 77
Net profit.....	\$48,743 03	\$32,897 03	.....	.....
Average per cow.....	\$12 18	\$32 31	.....	\$262 83
Net loss.....	.....	.....	\$26,036 64	.....
Average per cow.....	.....	.....	\$25 83	.....
Cost of 100 pounds milk.....	\$1 282	\$1 23	\$1 88	\$0 64
Cost of one quart milk.....	\$0 0275	\$0 0265	\$0 0406	\$0 0138
Cost of one pound fat.....	\$0 35	\$0 31	\$0 50	\$0 21

Two hundred seven cows like the best one would have given as much milked and more than 80 per cent of the fat produced by the poorest 63 herds of 1,008 cows. Note that one-fourth of the 4,000

show an average loss of \$25.83; the cost of feed was highest in the poorest herds. Note the splendid production of the best cow.

REASONS FOR DAILY WEIGHING OF THE MILK OF EACH COW IN THE HERD

1. It tells the dairyman when all the cows are milked. In a large herd it is not an uncommon thing to miss a cow.
2. It increases the interest of both the owner and the help.
3. It increases the interest of the farmers' boys in the dairy business as nothing else will.
4. It gives the only correct basis for economical feeding.
5. It often detects a sick animal by calling attention to the falling off in the milk.
6. It tells when the pastures begin to fail.
7. It enables the farmer to get more milk from the herd during the year and at a less cost, by stimulating him to better methods of feeding and care.

REPORTS FROM ASSOCIATIONS

In Dutchess County a member of the association found that his test at the milk station was 3.3 per cent. for the month, while his association test was 4 per cent. On calling the attention of the manager to the matter, a mistake was found and the dairyman received another check for the month's milk that more than paid the cost of membership in the cow-testing association for the year.

The tester from Sullivan County writes: "When the association started in December last, not a member was feeding a balanced ration. Before the cows went to grass the past spring, nearly every farmer had changed to a mixture giving more milk at a less cost of feed and with less udder trouble."

From Schoharie County comes the report that the tests of several members have been raised at the creamery. Some farmers have kept the milk of low-testing cows for home use. Calves that never would have been kept have been raised from dams with good records. The records have made good sales for cows. A better-balanced ration is fed, thus lowering the cost of feed. Some dairymen are keeping cows that they intended to dispose of; others are selling cows that they intended to keep.

In Otsego County, Mr. Henry L. Wardwell, by employing the tester for two days in the month, has been able to have his herd tested for the Registry of Merit of the American Jersey Cattle Club. The reports are verified and vouched for by Director F. G. Helyar, of the State School of Agriculture, Morrisville, N. Y.

The Hartford-Hebron Association, in Washington County, reports records from the herd of the E. B. Norton estate as follows:

Our herd is now headed by Brookside Torono, No. 97199, a well-known son of the famous Hood Farm Torono, 60326. Among his two-year-old daughters which we now retain are the following, with their best month records:

Brookside Jewel, 314366, 730 lbs. milk, avg. test, 5.2%, 37.96 lbs. fat, 42.30 lbs. butter, 159 lbs. grain. June, 1916, and first month after freshening.

Brookside Lady, June, 1916, 932.4 lbs. milk, avg. test, 7.6%, 70.86 lbs. fat, 83.36 lbs. butter, 159 lbs. grain.

Brookside Queen, 314367, May, 1916, 1054 lbs. milk, avg. test, 5.5%, 57.97 lbs. fat, 68.20 lbs. butter, 159 lbs. grain.

Brookside Daisy, 314365, June, 1916, 836.5 lbs. milk, avg. test, 6.5%, 54.37 lbs. fat, 63.96 lbs. butter, 159 lbs. grain.

Brookside Lassie, 314364, June, 1916, 915.6 lbs. milk, avg. test, 6.5%, 59.51 lbs. fat, 70.01 lbs. butter, 159 lbs. grain.

Brookside Rosebud, 314370, June, 1916, 802.4 lbs. milk, avg. test, 5.2%, 41.72 lbs. fat, 49.08 lbs. butter, 159 lbs. grain.

COWS ALREADY QUALIFIED IN REGISTRY OF MERIT

Victor's Albertie, 240616 (R. of M.) Class AA, 9531.8 lbs. milk, 506.07 lbs. fat, 595 lbs. 6 oz. butter, 336 days in milk.

Marjoram Brookside, 207976 (R. of M.), 10,618 lbs. milk, 538 lbs. fat, 633 lbs. 3 oz. butter.

Eurotas Dot, 288399 (R. of M.), 6529 lbs. milk, 376 lbs. fat, 442 lbs. 14 oz. butter. (Heifer.)

Rose Brookside, 187196 (R. of M.), 9197 lbs. milk, 399 lbs. fat, 470 lbs. 1 oz. butter.

Royal Missel, 225565 (R. of M.), 8936 lbs. milk, 439 lbs. fat, 516 lbs. 10 oz. butter.

Royal Insie, 225512 (R. of M.), 11,228 lbs. milk, 476 lbs. fat, 560 lbs. 12 oz. butter.

Royal Eurotas, 213787 (R. of M.), 9202 lbs. milk, 510 lbs. fat, 600 lbs. 12 oz. butter.

Eurota Eurotas, 271538 (R. of M.), 7122 lbs. milk, 403 lbs. fat, 474 lbs. 8 oz. butter. (Three-year-old.)

My Royal Flirt, 298656 (R. of M.), 5446.8 lbs. milk, 308.41 lbs. fat, 362.13 lbs. butter. (Heifer.)

Eurotas Missel, 288398 (R. of M.), 8176.9 lbs. milk, 459.48 lbs. fat, 540 lbs. 9 oz. butter.

Estimated butter in all instances 85% fat.

Missel Brookside, 182101, milked 59 lbs. in one day, and 1525 lbs. in 30 days.

The Warsaw Dairy Improvement Association, Wyoming County, has had during the last year the noted Jersey herd of Mr. F. B. Keeney. The records of the following cows show what can

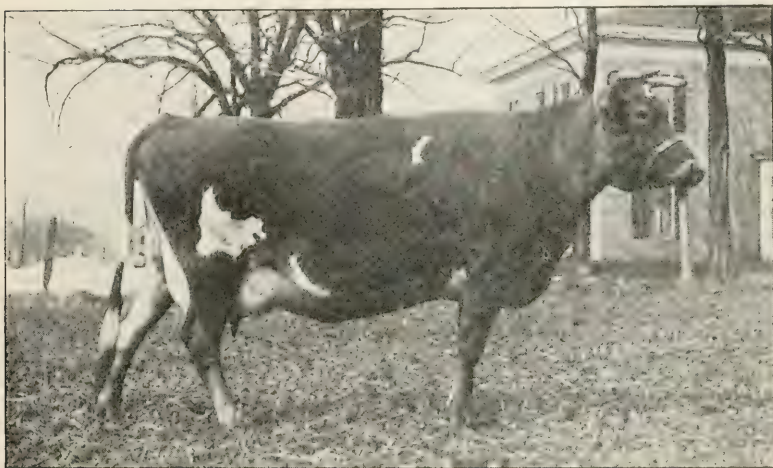


FIG. 546.—JACOBA'S LORETTA, 251186



FIG. 547.—JACOBA'S CORINNE, 251615

be done by an intelligent system of selection and breeding with continuous milk and butter-fat records of the individual cow:

Jacoba's Loretta, 251186, No. 2506, Class A, Advanced Registry of Merit, A. J. C. C., born May 21, 1909.

Date of freshening	Butter produced	
	Pounds	Ounces
May 3, 1911.....	353	1
Nov. 3, 1912.....	635	7
Dec. 12, 1913.....	693	13
Jan. 14, 1915.....	893	13
March 21, 1916.....	198 (in two months)	

Total, five calves and 2,577 lbs. 2 oz. butter, at 6 years 10 months old.

Jacoba's Corinne, 251615, No. 2085, Class A, Advanced Registry of Merit, A. J. C. C.

Date of freshening	Butter produced	
	Pounds	Ounces
Nov. 18, 1911.....	367	3
Dec. 23, 1912.....	643	13
Feb. 21, 1914.....	726	13
April 15, 1915.....	630	9 (317 days)
Apr. 28, 1916		

Total, five calves and 2,428 lbs. 12 oz. butter, at 6 years 6 months old.

Jacoba's Mona, 251191, No. 1921, Class A, Advanced Registry of Merit, A. J. C. C., born November 13, 1909.

Date of freshening	Butter produced	
	Pounds	Ounces
Jan. 3, 1912.....	366	11
Feb. 19, 1913.....	508	15
April 13, 1914.....	630	9
May 25, 1915.....	806	1
July 7, 1916		

Total, five calves and 2,312 lbs. 14 oz. butter, at 6 years, 8 months old.

No other cow has produced a total equal to any one of these three at equal age.



FIG. 548.—JACOBA'S MONA, 251191



FIG. 549.—POGIS IRENE 2D, 146435, DAM OF JACOBA IRENE, 146443

The Jersey cow, Pogis Irene 2d, 146435, celebrated her nineteenth birthday by completing a year's record of 9,930 pounds of milk, containing 695 pounds of 85 per cent butter. She carried a calf during 200 days of this test.

The production of almost 700 pounds of butter by a cow of her age is a wonderful performance in itself, and, when taken in conjunction with her previous records, should place her among the notable cows of the dairy world.

She was started on her first test June 12, 1910, and has made the following records:

Year	Age	Pounds milk	Pounds butter	Days in calf during test
1910	14 years.....	9,177	573	193
1911	15 years, 4 months.....	8,950	615	224
1912	16 years, 6 months.....	9,270	624	150
1914	18 years.....	9,930	695	200

Pogis Irene 2d's value was first recognized in 1909, when her daughter, Jacoba Irene, 146443, broke the record of the Jersey breed by producing 1,121 pounds of butter in a year. Pogis Irene 2d has now three daughters in Advanced Registry, and the fourth one is now on test.

NOTE.—The New York State Fair Commission announces the following premiums to be awarded at State Fair, September 11-16, 1916:

To the member of a cow-testing association whose herd of from ten to nineteen cows shall show the largest increase in average milk production over the records of the preceding year—first prize, \$15.00; second prize, \$10.00.

PLANS FOR THE FUTURE

A. J. NICOLL, Delhi, N. Y.

Farmers' Institute Lecturer

An important factor in the success of dairy improvement association work in New York State has been the very efficient work done by the farm bureaus of the different counties; and as the demand for register-of-merit work has increased, it has seemed best to change the name of the organization and to have a definite understanding between the different parties interested in carrying on the work as to what each should be responsible for. At the normal institute held in Ithaca, in November, 1915, a plan was discussed that has been developed during the past winter and is now ready to be tried out by the different associations of the state. Under the old plan, the Bureau of Farmers' Institutes found it difficult to obtain data and to keep in touch with the different organizations. As none of the officers of the association are paid for their work, correspondence was often unanswered, and valuable data were unavailable. Under the proposed plan each party has certain responsibilities that are assumed in a written agreement, and, if any part of the work fails, the responsibility can be placed where it belongs.

The high cost of doing advanced registry work, or, in other words, of keeping official yearly records of dairy cows of the different breeds, has created a demand on the part of a large number of dairymen for this class of work to be done under the direction of the Department of Agriculture and the farm bureaus of the state. The summarizing of the record books that has been done free for the associations by the Bureau of Farmers' Institutes has often been delayed on account of the lack of funds to employ the extra assistants needed to complete the yearly records and return the books promptly to the owner. Under the proposed plan this work will be done quarterly by the testers under the direction of the farm bureau managers, thus enabling the farmer to have his books fully summarized at the close of the year.

The duties of the tester will be much the same as heretofore, except in the matter of summarizing the records, for which he

will be paid one day in the month by the farm bureau of his county, in counties where farm bureaus are established. He will also have the additional duties of conducting the register-of-merit work as described on pages 2209-2217.

We strongly advise all dairymen to practice the regular weighing of each cow's milk at each milking, as it will keep him in closer touch with the individual cow, will create a greater interest on the part of both himself and his help, and will amply repay him for the little time it requires. Blanks for keeping the daily records of milk will be furnished free by the Bureau of Farmers' Institutes.

If for any reason a dairyman cannot weigh at each milking, the weight, calculated from weighing each cow's milk one day in the month and multiplied by the number of days in the month, will come very close to the actual weight. The following is a record of a herd of 20 cows for the month of April, 1916, and shows that there is little difference in the actual and the calculated weight:

Cow	Weight		Excess	
	Calculated	Actual	Calculated	Actual
1.....	765	695	70	.....
2.....	252	276	.....	24
3.....	654	642	12	.....
4.....	756	743	13	.....
5.....	816	863	.....	47
6.....	618	650	.....	32
7.....	360	345	15	.....
8.....	540	548	.....	8
9.....	666	647	19	.....
10.....	690	692	.....	2
11.....	438	381	57	Going dry
12.....	570	575	.....	5
13.....	633	662	.....	29
14.....	516	517	.....	1
15.....	345	374	.....	29
16.....	573	576	.....	3
17.....	258	254	4	.....
18.....	675	680	.....	5
19.....	456	463	.....	7
20.....	528	489	39	.....
Total.....	11,109	11,072	229	192

NOTE.— Difference between actual and calculated weight, 37 pounds.

A similar result is shown in the following table, which is made up from the weights of another herd:

Cow No.	WEIGHT		EXCESS	
	Calculated	Actual	Calculated	Actual
1.....	666	651	15	.....
2.....	600	579	21	.....
3.....	587	576	11	.....
4.....	666	667	.....	1
5.....	300	307	.....	7
6.....	852	863	.....	11
7.....	300	292	8	.....
8.....	672	693	.....	21
9.....	711	703	8	.....
10.....	330	342	.....	12
11.....	594	579	15	.....
12.....	807	885	.....	78
13.....	774	754	20	.....
14.....	330	342	.....	12
15.....	977	998	.....	21
16.....	1,062	1,057	5	.....
17.....	453	444	9	.....
18.....	549	566	.....	17
19.....	683	648	35	.....
20.....	1,094	1,086	8	.....
Total.....	13,007	13,032	155	180

NOTE.— Difference between actual and calculated weight, 25 pounds.

Some dairymen think that they can tell the production of milk by seeing it in the pail. The production is generally based on the quantity of milk given in a day when the cow is at her best. Among dairymen it is a common saying that a certain cow is a large producer because "in the best of the season you can't milk her in a pail." We often hear this, yet if a complete year's record were kept, it is very likely that the cow that was supposed to be "the best in the herd," actually gave less milk and made less fat than did several others that never quite filled the pail. The following table gives the record of eight cows in the same herd, showing that the cow giving the largest quantity of milk in a day did not give the most milk throughout the year:

Cow	Age	Best day's milk	Total yield milk	Per- centage	Total yield fat
3.....	6	35.5	7,664	4.06	311.0
4.....	3	37.0	5,658	3.38	191.6
6.....	13	37.7	6,606	3.86	255.4
10.....	5	32.7	6,229	3.73	232.5
11.....	7	35.4	7,476	2.97	222.6
13.....	3	37.7	7,418	3.50	259.8
17.....	3	18.9	5,715	3.96	226.6
25.....	6	31.1	6,725	3.20	215.4

Note that cow 3 was the largest producer of milk and the highest tester in butter fat, but she did not give so much milk in a day as cows 4, 6, or 13. Cow 17 gave only about half as much milk on her best day as did cow 4, yet she gave 57 pounds more milk in the year and made 35 pounds more fat.

THE DAIRY IMPROVEMENT ASSOCIATION

“The dairy improvement association” is the name now used to designate the cow-testing associations of New York State. The man in charge, formerly known as the official tester, is now known as the “dairy demonstration agent.”

THE DAIRY DEMONSTRATION AGENT

The dairy demonstration agent must be a man of good moral character. He must be a total abstainer from intoxicants. He must be neat in appearance and kind and obliging in his conduct. He must be able to pass a satisfactory examination in milk testing, feeding dairy cows, and dairy management. His books must be neatly and accurately kept, and the figures must be distinct. He is to summarize the record books as a part of his regular work. He must be prompt in reaching each farm in time for the evening milking and be on hand promptly when the time comes for milking in the morning. He must be quiet about the barn and neat and careful in weighing, straining, and sampling the milk. The dairy demonstration agent must furnish a horse and rig or other suitable conveyance to transport himself and the outfit from farm to farm.

The dairy demonstration agent is to follow instructions as issued by the director of farmers' institutes.

Together with the director of farmers' institutes, the county farm bureau manager, and the president of the dairy improvement association, the dairy demonstration agent must sign the following agreement:

MEMORANDUM OF UNDERSTANDING BETWEEN THE DIRECTOR OF FARMERS' INSTITUTE OF NEW YORK STATE DEPARTMENT OF AGRICULTURE, THE MANAGER OF COUNTY FARM BUREAU, THE PRESIDENT OF DAIRY IMPROVEMENT ASSOCIATION, AND, DAIRY DEMONSTRATION AGENT.

(1) This Memorandum is entered into by the Director of Farmers' Institutes, New York State Department of Agriculture, by the Manager of the County Farm Bureau under the authority of the executive

committee of the County Farm Bureau Association and the Director of Farm Bureaus of New York, by the officers of the Dairy Improvement Association, the home office of the latter being at, New York, and by, Dairy Demonstration Agent.

(2) The purpose of this Memorandum of Understanding is to provide for the joint cooperative conducting of a dairy improvement association and the cooperative employment of a dairy demonstration agent approved by the Director of Farmers' Institutes to do work with such association and elsewhere in County as hereinafter specified.

(3) In consideration of the dairy improvement work hereinafter set forth to be performed, the Director of Farmers' Institutes hereby agrees, subject to legislative appropriation, that he will supply all members of the Dairy Improvement Association and the Demonstration Agent with all necessary blanks such as stable sheets and herd-record books; furnish experts to assist in the organization and conduct of the work upon request of the Farm Bureau Manager, paying the traveling expense of such experts to the county in which work is done, conveyance and entertainment to be furnished by the County Farm Bureau or by the Association, as the former may determine.

(4) The Manager of the Farm Bureau, subject to authorization by the executive committee of the Farm Bureau Association and approval by the Director of Farm Bureaus, agrees to exercise close supervision over the work of the Dairy Demonstration Agent; to assist him at all times in planning and carrying out his work; and to report promptly to the other parties to this Memorandum failure of said Agent to perform his duties in an efficient and effective manner. He also agrees to report the condition of his associations to the Director of Farm Bureaus quarterly, or as the latter may request, and to send duplicates of the monthly records of all cows entered in Register-of-Merit work to the Director of Farmers' Institutes.

(5) The President of the Dairy Improvement Association agrees to see that the Demonstration Agent is furnished with necessary supplies, such as Babcock tester, acid, and scales, and that there are sufficient members in the Association to provide him a minimum of 24 days' work each month at two dollars (\$2) a day and board for himself and his horse. The President further agrees to use his best efforts to secure the collection of fees, not to exceed two dollars (\$2) annually from each member, for the purpose of providing the Agent with necessary supplies, and to see that all members in the Association pay the Agent promptly for his services as above.

(6) The Dairy Demonstration Agent agrees to follow the instructions as published by the Director of Farmers' Institutes, and to report monthly in writing on blanks provided for the purpose to the Manager of the Farm Bureau and to the President of the Dairy Improvement Association on the progress of his work. He further agrees not to undertake any new lines of work without the official sanction of said Manager and President. In counties where there is no farm bureau manager, the Dairy Demonstration Agent agrees to report to a duly authorized representative of the Bureau of Farmers' Institutes, who will otherwise perform

the functions of a farm bureau manager with regard to dairy improvement association work.

(7) It is understood that the Farm Bureau Manager may, upon authorization by the executive committee of the Farm Bureau Association, arrange for the employment of the Dairy Demonstration Agent by the Farm Bureau one or more days each month to do such work in connection with said association and with the dairy improvement projects of the Bureau as seems wise, said Agent's salary of two dollars (\$2) a day and his necessary traveling and living expenses to be paid by the County Farm Bureau.

(8) It is understood, after the Dairy Improvement Association has been cooperatively organized and the Dairy Demonstration Agent jointly employed, that the general supervision of the work of the Association and of the Agent is delegated to the Manager of the Farm Bureau, and that no party to this Memorandum will undertake any new lines of work without his approval. In counties where there is no farm bureau, this general supervision will be performed by an authorized representative of the Bureau of Farmers' Institutes.

Date
Director of Farmers' Institutes of New York State
Department of Agriculture

Date
Manager of County Farm
Bureau

Date
President of Dairy Improvement
Association

Date
Dairy Demonstration Agent

He shall report monthly in writing, on blanks provided for the purpose, to the manager of the county farm bureau in the county in which the association is located and to the president of the dairy improvement association. In counties where there is no farm bureau the dairy demonstration agent will report to a duly authorized representative of the Bureau of Farmers' Institutes, who will otherwise perform the functions of a farm bureau manager with regard to the work of dairy improvement associations. Copy of monthly report blank follows:

Dairy Improvement Association Report

(Monthly report of Dairy Improvement Association Agent to Farm Bureau Manager and President of Dairy Improvement Association.)

Month Date, 191..
 Name of Association
 No. of dairies No. of cows
 Monthly increase: Herds Cows
 Monthly decrease: Herds Cows
 No. cows completing yearly record:
 No. herds in Register-of-Merit:
 No. cows in Register-of-Merit:
 Monthly increase: Herds Cows
 Monthly decrease: Herds Cows
 No. cows completing yearly Register-of-Merit record:
 Largest individual monthly record of milk produced:
 Largest individual monthly record of butter fat:

On reverse side of this sheet give list of cows producing forty pounds of butter fat or 1200 pounds of milk, or more.

General remarks: (Give here notes of interest concerning the association, including any facts covering desirable change of rations, giving the rations formerly used and those recommended; give also any specific benefits derived from the association. Use extra sheet if necessary.)

REGISTER-OF-MERIT

All dairymen who are members of a dairy improvement association may enter any of their cows in the register-of-merit test conducted by the Bureau of Farmers' Institutes of the New York State Department of Agriculture in cooperation with county farm bureaus and dairy improvement associations.

The object of the register-of-merit test is to secure authentic records of yields of grade or pure-bred cows. For all cows whose records meet the requirements as herein set forth, a certificate of merit will be issued to the owner. These records may also be published at the option of the director of farmers' institutes. The results of all register-of-merit tests will constitute a permanent record and will be kept on file in the Bureau of Farmers' Institutes, New York State Department of Agriculture, Albany, N. Y.

This test covers a period of not more than 365 consecutive days, and must be authenticated by applying, at not less than monthly intervals, the Babcock test.

SEMIOFFICIAL OR REGISTER-OF-MERIT TESTING OF PURE-BRED COWS

By agreement with the Ayrshire and Jersey breed associations, the Bureau of Farmers' Institutes of the New York State Department of Agriculture, in cooperation with county farm bureaus, is prepared to conduct semiofficial or register-of-merit tests through the channels of the regular dairy improvement associations. Such tests are supervised by the state schools of agriculture, which by arrangement authenticate the work of the regular dairy demonstration agents and report the results of the tests to the proper breed officials. The association rules covering the breed to which the cows belong are followed by the tester in doing his work.

When, in the case of pure-bred cows, the officials of the respective breed associations do not accept the work of dairy demonstration agents in supervising semiofficial tests, or when the owners do not care to enter their cows for the same, the director of farmers' institutes will issue a register-of-merit certificate, provided the following rules as recommended by the Official Dairy Instructors' Association and amended to meet the conditions of a dairy improvement association are observed, and the cows make a production as follows:

If the test is commenced the day the cow is two years old, or previous to that day, she must produce, within one year from the date the test begins, 250.5 pounds of butter fat. For each day the cow is over two years old at the beginning of her year's test, the amount of butter fat she must produce in the year is fixed by adding one-tenth (0.1) of a pound for each such day to the 250.5 pounds required when two years old. The ratio of increase applies until the cow is five years old at the beginning of her test, when the required amount will have reached 360 pounds, which will be the amount of butter fat required of all cows five years old or over. The standards are based upon one complete year's record from the time of beginning, regardless of any time which may be lost by being dry or calving during that period.

RULES FOR NEW YORK STATE REGISTER-OF-MERIT WORK

(Recommended by the Official Dairy Instructors' Association and amended to meet the conditions of register-of-merit work.)

1. Before he can do register-of-merit testing, the dairy demonstration agent must apply for and receive from the director of farmers' institutes a certificate of authority. Such application should be made through the local farm bureau.

2. When a member of a dairy improvement association desires to enter cows for register-of-merit test, the agent must fill out duplicate copies of the register-of-merit entry blank furnished by the Bureau of Farmers' Institutes according to instructions thereon, and forward them to the manager of the local farm bureau, or, in case no bureau exists in the county, direct to the Bureau of Farmers' Institutes, Albany, N. Y.

3. At the time of each monthly test he must fill out duplicate copies of the regular register-of-merit monthly statement as required by the Bureau of Farmers' Institutes and forward as above.

4. The owner of the cow or cows must weigh the milk daily, and keep a record of such weights on approved blanks. The dairy demonstration agent will weigh, sample, and test the milk on at least one day each month, at as near monthly intervals as possible. The dairy demonstration agent's tests will be accepted as official records and his weights used to check the daily weights of the owner. This shall be done by comparing his weights on the day of test with the average of at least three of the owner's daily weights, selected at not less than five-day intervals during the test period. The owner's weights will be accepted as official if in accord with the dairy demonstration agent's weights. In case the owner's weights show discrepancy, it shall be noted on the agent's monthly report.

5. The dairy demonstration agent shall be present at the last regular milking preceding the beginning of the test, and shall see that the cow is milked dry. He shall note the hour that this milking is made and the last milking of the test shall be made at the same hour.

6. He must be present at every milking during the test and see that the pail contains nothing but the milk drawn from the cow under test.

7. Only one cow shall be milked at a time, and the dairy demonstration agent must in every case be in position to observe the milker during the whole milking.

Immediately after the milk is drawn at each milking he shall take charge of the pail and contents, weigh the same on approved scales, and enter the exact weight of the milk at once on his records.

8. An extra pail shall be provided by the owner, and the milk shall be poured from one pail to another until thoroughly mixed. The dairy demonstration agent shall then take samples of the milk sufficient for his test and for the composite sample.

The samples of milk shall be kept under lock and key, or in sight of the dairy demonstration agent, until tested.

The fat determinations shall always be made in duplicate, using properly calibrated glassware, and both determinations recorded. The average must be used in computing the amount of fat. The samples taken at any one milking shall not be thrown away until satisfactory duplicate tests of the milking are obtained.

Readings of the tests shall be made at a temperature of 130° to 140° F. If the duplicate determinations vary more than .2 per cent, the test must be repeated.

9. A composite sample for each cow, correctly made and preserved, shall be forwarded to the nearest state school of agriculture immediately upon completion of the test. In case of a two-day test, this composite sample shall contain 3 c.c. of milk for each pound of the milk produced during the test. Suitable containers for such composite samples shall be furnished by the owner of the cow on test.

10. The production of butter fat for the month shall be determined by multiplying the total milk production for the month by the average test of the milk on the day of the inspection. This average test is determined by dividing the total production of fat on the day of test by the total production of milk.

11. The dairy demonstration agent shall report to the director of farmers' institutes through the farm bureau manager in the county any obvious violation of the rules.

12. All record books and blanks except the monthly herd-record books must be secured from the county farm bureau agent, in counties where farm bureaus are in operation. If no farm bureau exists in the county, such supplies must be obtained through the representative designated by the Bureau of Farmers' Institutes.

INSTRUCTIONS CONCERNING THE CONDUCT OF OFFICIAL TESTS

(a) Any neglect on the part of the dairy demonstration agent to maintain a gentlemanly bearing, either as to personal appearance and cleanliness or as to conduct, will be considered sufficient cause for immediate removal without notice.

(b) The dairy demonstration agent shall not receive from the owner any money or valuable consideration other than the per diem fixed by the dairy improvement association of which the owner is a member.

(c) The required temperature mentioned in Rule 8 may be obtained with hand machines, by placing the machine on a hot stove during the process of testing or by the addition of boiling water at least twice during the test.

(d) If the cows are milked four times a day, the dairy demonstration agent shall test after each milking except the late one at night.

(e) The dairy demonstration agent shall keep his glassware clean and bright.

(f) Great care must be exercised that the names and records of cows are not transposed.

Ear-tag numbers of all cows on monthly inspection must be reported each month.

(g) All data required on monthly report blanks must be secured from owners and reported each month.

(h) All reports must be made promptly.

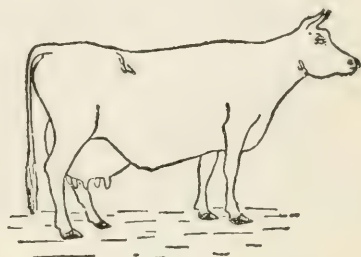
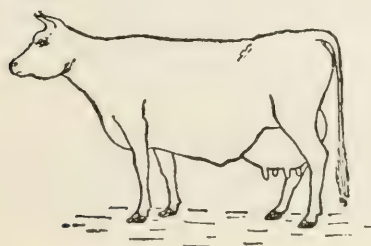
(i) A representative of the Bureau of Farmers' Institutes (in company with the farm bureau manager, in counties where farm bureaus exist) will make semiannual inspections of the work of all dairy demonstration agents. Final approval of the year's register-of-merit records will not be given unless the report of these semiannual inspections is satisfactory.

CERTIFICATE

When a cow duly entered in the register-of-merit test fulfills the requirements as noted, the following register-of-merit certificate will be issued to the owner:

Register-of-Merit Certificate

Name of Cow	Breed	Color	Age		
			Years	Months	Days
.....					



This is to certify that the cow described above, with markings as shown on charts, was duly entered in the Register-of-Merit test, conducted by the Bureau of Farmers' Institute of the New York State Department of Agriculture in cooperation with the County Farm Bureau and the..... Dairy Improvement Association, on the day of, 191.., and completed full year's test (365 consecutive days) on the day of, 191.. The total weight of milk produced by the above cow during this test period was pounds; the total butter fat, ... pounds. This record is now on file in the office of the Bureau of Farmers' Institutes, New York State Department of Agriculture, Albany, N. Y.

Approved;

.....
Director of Farmers' Institutes

.....
Manager County Farm Bureau

Date, 191..

REGISTER-OF-HONOR

To accommodate members of dairy improvement associations who desire to enter grade cows or pure-breds for register-of-merit tests, but who do not feel like undergoing the extra expense of having the dairy demonstration agent present at an inspection milking as called for in Rule 5, the Bureau of Farmers' Institutes will accept the cows for the tests, and if they meet requirements will issue a register-of-honor certificate on which is noted the fact that only two milkings have been officially observed. In such cases all of the foregoing rules apply except Rules 5 and 9.

SUPPLIES

The dairy improvement association is to furnish all necessary supplies to the dairy demonstration agent, such as a Babcock tester, acid, and scales. All books necessary for test records, and blanks for reports, including all register-of-merit reports, will be supplied free by the Bureau of Farmers' Institutes of the New York State Department of Agriculture, Albany, N. Y., as soon as the memorandum on pages 2206-2208 is properly signed and a copy filed with the Department.

To do register-of-merit work under the direction of the Bureau of Farmers' Institutes of the New York State Department of Agriculture, the dairy demonstration agent must have the following certificate of authority:

Register-of-Merit Certificate of Authority

To Whom it May Concern:

This is to certify that, of, is hereby duly authorized to do Register-of-Merit work in the Dairy Improvement Association, under the rules and regulations for such associations approved by the Bureau of Farmers' Institutes, New York State Department of Agriculture.

This certificate may be cancelled at any time if the conduct or work of the dairy demonstration agent is not satisfactory to the undersigned.

.....
Director of Farmers' Institutes.

Date, 191..

When the dairyman has one or more cows that he desires to enter in the register-of-merit test, the dairy demonstration agent must promptly fill out in duplicate and send to the county farm bureau manager the following entry blank:

Register-of-Merit Entry Blank

County

Association

Owner

Address

Date, ... 191..

(To be rendered in duplicate to manager of cooperating farm bureau by dairy demonstration agent **promptly** on entry of cows for Register-of-Merit test. The dairy demonstration agent shall retain a copy of this entry blank as filled, in order that cows may be similarly designated in making monthly reports.)

NAME OR NUMBER OF COW	Breed	AGE			Date fresh	Date bred	*Service of bull
		Year	Month	Day			

The above with chart on back of this sheet is an accurate description of cows that I desire to enter in the Register-of-Merit test conducted by the Bureau of Farmers' Institutes of the New York State Department of Agriculture, in cooperation with the County Farm Bureau and the Dairy Improvement Association.

Signed.....
Owner

Signed.....
Tester

Approved.....
Manager County Farm Bureau

Approved.....
Director of Farmers' Institutes

In counties where there is no farm bureau, the above entry blank shall be forwarded by the dairy demonstration agent to the duly authorized representative of the Farmers' Institute Bureau.

For cows entered in register-of-merit test the following blank must be promptly filled in duplicate and sent each month to the county farm bureau manager, or, in counties where there is no farm bureau, to the representative as designated by the Farmers' Institute Bureau:

* To be reported when service takes place.

STATE OF NEW YORK — DEPARTMENT OF AGRICULTURE
BUREAU OF FARMERS' INSTITUTES
REGISTER-OF-MERIT MONTHLY STATEMENT

(This statement is to contain records of cows entered for certification in Register-of-Merit test conducted by the Bureau of Farmers' Institutes of the New York State Department of Agriculture, in cooperation with county farm bureaus and dairy improvement associations, and must be rendered in duplicate to the manager of cooperating farm bureau by dairy demonstration agent promptly on the finish of monthly test.)

County.....

Association.....

Owner

Address.....

Month.....191.....

[illegible]

(If more than two milkings are taken, use two lines for each cow.)

Approved...

Signed..

Manager of.....County Farm Bureau

Dairy Demonstration Agent

Approved...

Director of Farmers' Institutes

* Cows must be designated by same name or number as used on entry blank.

WYOMING COUNTY'S DAIRY IMPROVEMENT ASSOCIATIONS

H. M. BOWEN, Warsaw, N. Y.

Farm Bureau Manager, Wyoming County

Dairying occupies a leading position in the agricultural activities of Wyoming County. In this industry our chief problem is the economic production of milk. The solution of this problem lies in the improvement of our dairy herds by the development of better individuals and the elimination of unprofitable ones.

The chief agency in attaining this object, embraced by a large number of our best dairymen, is the cow-testing association, now known as the dairy improvement association.

There are now operating in Wyoming County six of these organizations, aggregating 180 herds, with approximately 4,000 cows. Of these associations, three have reorganized under the name of dairy improvement associations, while three are still cow-testing associations and will be reorganized at the expiration of the present year.

In the associations that have been in operation for two or more years, approximately one-half of the members have remained from the beginning. While it requires considerable labor to reorganize an association, yet we never experience serious trouble and nearly always have men on the waiting list.

The demand for the work of the cow-testing association is very strong and we could easily form two more associations if we could find the time. A strong sentiment for the improvement of the dairy herd has grown up in our county as a result of our associations. The "robber cows" are becoming more and more unpopular, and our best dairymen are eliminating them from their herds as rapidly as possible. The registered sire is rapidly displacing the mongrel and is producing a marked change in our dairy herds. All of these results are to be credited largely to the cow-testing associations.

A county register of merit was established last year, and we publish monthly all cows in the associations giving over 1,350 pounds of milk or over 45 pounds of butter fat. We have in our

newly organized associations taken up the register-of-merit work as outlined by the state, and have already entered a number of cows for the meritorious list.

In each of our associations we have made a strong local organization by securing strong, capable, successful dairymen for officers and directors, and placing all the responsibility possible on them. We have used great care in selecting the best possible type of young men for the position of testers—young men who are not only efficient in their work, but who also possess leadership qualities. Perhaps in no way have the associations served the dairymen to better purpose than in pointing out to them the relation of cost of milk production to the price they receive for the product. The summaries show conclusively that a herd of average cows are in many cases a money-losing proposition. We have cost-accounted over 100 herds. As a result of this work the farmer is learning to apply to his business the same principles that other business men apply to theirs.

It has been shown that in the average herds of four associations in Wyoming County, eliminating pure-bred and low-producing herds, the average cost of producing 100 pounds of milk is \$1.37. This low cost has been made possible for the following reasons:

1. Alfalfa was generally grown.
2. Nearly all farms used silage.
3. All owners of these herds were members of cow-testing associations—some for more than one year—and had discarded the unprofitable cows.
4. Small losses by death in herds.
5. Low feed costs compared with other counties, not only because freight rates were less than in the eastern part of the state, but because some of the dairymen took advantage of the market and bought in large quantities.

The relation indicated between the cost of milk production and the price received could not have been established had it not been for the cow-testing associations. Not only have we proven the need of improvement of the dairy herd, but we have also shown conclusively that the producer of milk of high quality must be paid a price that warrants the cost of producing it.

The cow-testing association turns the X-rays of common sense on the dairy business as no other agency can do.

FUNDAMENTALS IN DAIRYING

EDWARD VAN ALSTYNE, Kinderhook, N. Y.

Director of Farmers' Institutes

(The following address was given at the annual dinner of the Wyoming County Cow-Testing Association, Warsaw, January 7, 1916.)

In order to have correct ideas on any subject, we must know the underlying facts, and from them reason logically. In order to do this we must dismiss from our minds all prejudice and previously formed opinions, accepting facts as they are, not as we had thought they were, nor as we should like to have them.

When I was up in Maine a few years ago, an old man living in the back country was asked, "What do you do in winter when the snow shuts you in?" He replied, "Sometimes we set and think, and sometimes we just set." While the latter certainly does not tend to mental development, I believe in the end it is better than to think crookedly. One of the great needs of the present day is for men to think straight, namely, first to get bottom facts, and then to draw logical conclusions from them.

My purpose today is to set in order before you some facts, easily to be apprehended by any unbiased mind. If we agree as to these we should be able to arrive at the same conclusions, even though they are at variance with what may have been our previous ideas. To "set and think" that we are the victims of the monopoly working against heavy handicaps, ignoring actual facts, will not only do us harm, but will take away a desire for the individual effort always fundamental for success.

Were we to take at face value all the statements in the agricultural press and from the lips of those with good intent, but whose mental processes stop too soon, we should be constrained to believe that most dairymen were on the road to bankruptcy. How can it be otherwise when apparently expenses far exceed receipts? These are not willful misstatements, but half-true statements, more harmful than downright lies. We know that it is rare for a dairyman to be sold out. In most cases they are paying for and improving their farms, educating their children, and bringing into their lives at least a degree of present-day necessities. In

these estimates all manner of costs are piled up on the old cow, while, in reality, it is impossible to set her on a pinnacle independent of the rest of the farm. She is part of the farm equipment; in many cases without her the farm could not possibly be run.

I shall divide what I have to say under four heads:

1. Profit from the farm crops marketed through the cow.
2. Increased value from the farm because of manure returned to the land.
3. Direct money profit.
4. The effect on the man.

PROFIT FROM CROPS

In many cases this is the only profit from the dairy, and, while it is too small, it is not to be ignored. One of the most prominent and successful of New Hampshire's dairymen told the speaker that when his hundred-cow dairy paid the interest and depreciation on the capital invested in them, paid for the labor, purchased feed, and returned for the large amount of farm products that they consumed a price sufficient to allow a fair income from the land, he was doing as well as the average business man. Many New York State dairymen are doing the same thing, but do not appreciate it.

Take the item of pasture. On many farms such land would be utterly valueless without stock—we shall not stop to consider the question of whether in some cases animals other than dairy cows could not be profitably substituted, for we are now dealing only with the dairy—yet this pasture is charged against the cow, and no credit is given the farm; yet, without the channel of the dairy to turn it into cash, there would be no income whatever from this source.

To a degree, the same is true of hay and forage. True, the man who sells his hay to his dairy at a less price than he could obtain for it at the station after expenses are paid, is not a good business man nor a good dairyman, and he needs a cow-testing association to help him weed out unprofitable cows. On the other hand, to charge such hay to the cow at the gross market price and then charge against her the labor of feeding it—which is less than it would be to put it on the wagon for market—is

unfair to the cow. Often clover hay and mixed grasses find their only profitable market through the medium of the dairy. For cornstalks, bean fodder, straw, and silage corn, there is no outside market without the aid of the cow to turn this very raw material into a finished cash product. These are large items on most farms. It is both customary and correct to figure silage corn at one-third the price of timothy hay. This year on that basis silage is worth at least five dollars a ton. A conservative yield of ten tons an acre returns fifty dollars to the farm. Silage is a profitable crop at \$30 an acre. What would I do this year with my thirty acres of silage corn without my dairy to turn it into cash? Why then pile all these costs on the cow, when she is the factor that makes it impossible to operate the whole farm at a profit? This naturally brings me to my second head.

PROFIT FROM MANURE

At the outset I wish to state clearly two facts, the first being that it does not follow in logical sequence that a dairy farm must increase in fertility. Alas, it is too true that I can point out many that in spite of having had dairies on them for at least a generation are not increasing in production. This is the fault of the management, not of the dairy—reasons I cannot now take up; let it be sufficient to say, however, that such cases are the exception, not the rule. The second fact I wish to emphasize is this: Because the owner fails to use manure from his dairy to the best advantage, it is as unfair to fail to give the cow full credit for it as it would be to fail to give her credit for butter fat lost through poor skimming or churning.

There are always two values to a fertilizer of any sort—the commercial value, based on the cost of the ingredients, and the agricultural value, based on its power to grow crops. The two are seldom the same; the former may be much more or less than the latter. What is the value of the voidings of a dairy cow for a year? The average dairy cow will void—liquid and solid—about 60 pounds daily, or almost eleven tons in a year. At \$2 a ton, a fair average commercial price for the nitrogen, phosphoric acid, and potash that it contains, the value would amount to \$22 annually. At present war prices for such ingredients, these values

might be doubled. Fully 50 per cent of the plant food is in the liquid, most of which is often wasted. While it is impossible to save it all, I am very certain, if the time and energy expended in tirades against milk handlers were put forth in an intelligent effort to save and properly utilize this by-product, the results would be much more satisfactory to the pockets of the dairyman. Without attempting to discuss methods of using the above economically, I would say that any good farmer can retain 75 per cent of the commercial value of his manure. The agricultural value of manure is usually more than the commercial, as evidenced by the results obtained from manure that has lost at least half of its plant food. Considering its humus-making content and its ability to increase materially that of the sod to which it is applied, and its value as a breeding place for soil bacteria, I am certain it is within the truth to say that the increased agricultural value will fully overbalance the loss in plant food when the manure is handled according to present intelligent methods. A profit, then, of at least \$20 a cow annually from increased fertility is not to be despised. That this has a financial, not an artificial, value, is evident by a comparison of the selling price of dairy farms and those of the same character from which crops only have been sold, for farm values must fundamentally be based on production.

It is interesting to listen to the involuntary testimony of the blacksmith-shop philosopher, when the production of some local farm is discussed: "Wall, no wonder, he has always kep a big lot of cows."

It is evident that a man whose cows have paid their costs, who has profitably marketed a goodly amount of farm produce, and annually turned \$20 of fertility for each cow to the land, need not fear the sheriff and is doing as good a business as the average merchant. Nevertheless, the man who is satisfied with the above is not possessed with the ambition necessary to achieve the highest attainment.

MONEY PROFIT

Having emphasized the fact that in many cases that which has enabled the dairyman to pay for his farm and to educate his children has come from profit on crops through the cow and

from more certain and increased production, I now turn to the rather difficult proposition of considering a direct money profit to the dairyman. Naturally, one's first thought is profit from an increased price. I am a dairyman with from forty to fifty milch cows. On them I depend to a large degree for necessary income. I realize full well that the margin of profit is not so large as it should be, considering the capital and the labor invested. No one would more gladly welcome an advance in price than I. Such advance has come during the years, but always temporary with an increased cost of production or of better quality. I can see no reason why different conditions should exist in the future.

We cannot ignore the fact that in the last analysis, values are based on the law of supply and demand. Many have tried, but no one has ever succeeded in maintaining a corner on any of the world's great staples in the face of a large production. This is particularly true of a perishable product such as milk. If the large handlers were able to obtain a supply always commensurate with their daily needs, the price could be materially increased. In view of the variable supply, they must have a surplus, which, when not needed for consumption as milk, must be turned into manufactured articles. For the major part of the year, there is fully as much milk offered as the market needs. When the surplus is turned into butter and cheese, we are competing with the whole world. The great Northwest and a large portion of Canada is dotted with creameries and cheese factories, the product of which both quickly and cheaply reaches our great eastern centers. In normal times the price of these commodities is affected by the price in the English market. These are supplied from Canada, Denmark, and Australia. The problem is therefore a complex one. The first step, then, to obtain an increased price for milk in our great cities is to regulate the quantity shipped by local control of the surplus.

It is true, the consumer obtains more real food value in milk than in almost any other article he buys, and for this reason the consumption might be largely increased. A few years ago an attempt was made on the part of the large handlers to raise the

price in New York City. This was met by an onslaught from the daily press, charging extortion, which resulted in a decreased consumption; a surplus quickly accumulated, and the old price was restored. It is asserted that the large handlers are receiving more than their share of the profits. The investigation made by Attorney-General O'Malley for the year 1910 showed that profit came from the volume of business, not from a large margin per quart. Certain it is that under present conditions, most of the time, there is a supply ample for daily requirements. If the price were raised a cent a quart, without providing for control of the surplus, within less than twelve months there would be such an increase in production that the surplus would compel a reduction in price below that at present obtained. Dairymen would feed more liberally, would put on more cows, and many grain farmers would go into dairying because the business would be profitable. It is a law of trade that no business can for a long period return a profit beyond the average. Witness the fruit business in our state today.

As an illustration, let me call to your attention conditions existing a few years ago. I chanced to be in a large milk station on the day in March when prices were given out for the next six months. They were from five to ten cents a hundredweight lower than those paid the same month the previous year. I asked why this reduction, with labor as high and feed higher, and the same retail price for milk. I received no adequate reply, but the answer was this: The winter had been favorable for milk production. Cows were coming out satisfactorily. Apparently they could obtain all the milk they needed at the reduced price. Why, then, pay a higher price and stimulate an increased product that they did not want? Surely, a good business reason. What followed? April and May justified their forecast. By June there was a lack of rainfall; pastures began to fail. By July 1 there was a shortage; by the latter part of the month, milk was so scarce as to command a premium. In August the handlers voluntarily increased the price thirty cents a hundred. In early September prices were sent out for the six months beginning with October, which were higher than had ever before been paid.

Philanthropy? No, business. The supply was far below the demand. It now paid to make milk. Men began to feed and, wherever possible, to enlarge their herds. The increase naturally was not at once apparent. The fall was one of abundant rainfall. Pastures were never better, holding out to the latter part of November. The corn crop was a large one, and feed dropped in price two dollars a ton. By January 1 there was more milk than the market knew what to do with; in March, butter was selling for June prices. Not a few small dealers failed. All natural conditions readily repeated. I realize this is not pleasing. I wish it were not true, but it is much better for us to look the facts in the face than to beguile ourselves with sophistry.

What I have to suggest is old. If we are to make a direct money profit, we must do it with a smaller number of cows and better ones, and these more intelligently fed, thus making a profit at present prices, and being in a position to make a still larger one if the longed-for day of high prices comes—that day for which so many prophets have “longed for and died without sight.” The purpose of the cow-testing associations is to assist in doing just this thing.

Direct money profit may also come through an increased price for a better article. By that I mean milk from healthy cows, produced and handled under sanitary conditions, and containing a guaranteed amount of butter fat. Such milk can be produced by any man of moderate means in inexpensive stables. From personal experience, I can testify that after one's herd has been freed from tuberculosis, thus eliminating diseased, barren, and hence unprofitable cows, one can produce milk more cheaply than from a herd where disease exists. No one practice will do more to free the herds of the state from this disease than the pasteurization of skim milk and whey, much of which, coming from cows whose milk contains the bacilli of tuberculosis, is a source of infection to all animals fed therefrom.

Those producing milk other than that classed as “Grade A” will always compete in a market best supplied, and consequently will receive the lowest price. There are, and will be, an increasing number of people who are willing to pay an increased price

for a superior article. Milk of this character produced under common sense—not dude—conditions will yield a margin of profit beyond the increased cost of production.

EFFECT ON THE MAN

By no means least in importance is the effect on the man of associating with well-bred cattle, properly housed, and of sending out a product of which he is not ashamed. If I am able to impress on you the importance of this point, the others will follow as a matter of course. If a dairyman is merely keeping cows, without regard to their character or that of their product, his work is drudgery, and he is “of all men most miserable.” When we can come to appreciate that we are dealing with soil and plant life to feed the animal, and that next to man this animal is one of the highest forms of life, all of which are capable of great development, and that by this development we are working hand in hand with God Almighty, our work will take on a dignity undreamed of before, and it will be impossible for us not to make the best of the soil, plants, and animals, and of ourselves as well. We shall come to the enlarged vision that will cause us to appreciate that every dollar of real profit is that which shall give to us and ours a more abundant life.

A man whose soil, intelligently handled, produces at its best; a man who has well-bred, healthy stock, comfortably stabled, whose product he is willing to acknowledge anywhere, is bound to respect himself and to command the respect of his associates, to a degree impossible to him who is satisfied with a minimum of production in either plants or animals, or whose association is with scrub stock kept in unsanitary stables—stock whose product will scarcely be accepted in the markets—for, of necessity, we all partake and become a part of our environment.

AGREEMENT, CONSTITUTION AND BY-LAWS

Where it is desired to organize a dairy improvement association, the following form of agreement should be signed by at least twenty-four dairymen:

FORM OF AGREEMENT

WHEREAS, It is proposed to organize a dairy improvement association to be known as the Dairy Improvement Association, for the purpose of keeping records and making butter-fat tests of the cows of its members, and

WHEREAS, It is proposed to engage a suitable person for that purpose as soon as enough subscriptions are obtained to meet the expense,

Therefore, The undersigned each agrees to pay the sum of \$2.00 per day, besides board and lodging for the dairy demonstration agent and his horse at least one day in each month, while such agent is engaged in the work of testing the dairy of each subscriber. The dairy demonstration agent shall not work on Sundays, but shall have board and lodging for himself and horse at the place where he worked on Saturday. This agreement is not to become binding or operative until enough subscribers are obtained to keep the agent employed twenty-four days.*

The signers of the agreement then meet and adopt the following form of constitution and by-laws:

FORM OF CONSTITUTION AND BY-LAWS

1. This association shall be known as the..... Dairy Improvement Association.

2. The officers shall consist of a president, vice-president, secretary, treasurer, and two directors.

3. The officers shall be elected by the members at the annual meeting of the association and shall hold office for one year or until their successors are chosen.

* It is desirable that during the remaining two working days of the month the dairy demonstration agent shall occupy his time in the office of the farm bureau manager, computing his records and doing other work in connection with the association.

4. The officers shall constitute an executive committee, which shall have charge of the affairs of the association.

5. The annual meeting shall be held on the day of , at

6. Special meetings may be held at such time and place as shall be designated by the executive committee.

7. A dairy demonstration agent shall be employed by the executive committee and shall be under its general direction and responsible to it.

8. No member shall withdraw from the association during the year for which he agreed to join, and each member shall pay a membership fee* of \$. for the purpose of financing the organization.

9. New members may be admitted at any time upon the vote of the association.

10. These articles may be altered or amended at any regularly called meeting of the association, provided two weeks' notice is given in writing to each member by the Secretary of the Association.

11. The executive committee shall then engage the dairy demonstration agent to take charge of the work. The dairy demonstration agent shall be approved by the director of farmers' institutes.

* The membership fee should be not less than \$1.50.

STATE OF NEW YORK
DEPARTMENT OF AGRICULTURE
CHARLES S. WILSON, Commissioner

Bulletin 86

Report of Farmers' Institutes

Year June 15, 1915, to June 30, 1916,
Inclusive

BY
EDWARD VAN ALSTYNE
Director

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REPORT OF FARMERS' INSTITUTES

JUNE 30, 1916.

To HONORABLE CHAS. S. WILSON, *Commissioner of Agriculture,
Albany, N. Y.:*

My dear Sir.—I herewith submit to you my fourth annual report as Director of Farmers' Institutes. Owing to the change of the fiscal year from October 1 to July 1, this report extends to the latter date, which will make my calendar year—ending June 14—correspond with the fiscal year ending June 30. The advantages are obvious.

As a result of the appropriation in the supply bill of 1915, the various lines of work of my bureau were carried on until the regular appropriation became available—October 1. These activities you will find set forth in the different divisions of this report.

The most noteworthy facts of the year have been the hindrances to the regular institute meetings on account of continued storms and consequently almost or quite impassable roads. These conditions extended from the beginning of the season in early December until the end in March, and nine meetings had to be abandoned. In spite of these adverse conditions, the average attendance per session was only ten below that of last year, plainly indicating that the work is appreciated and that it is meeting the wants of the people, impelling them to attend at much personal discomfort. Closely allied with this is the other outstanding fact—that not only has there been almost an entire absence of criticism of the work and workers on the part of the people in attendance, but that there has been a general expression of appreciation on the part of those reporting.

I would call special attention to the section of this report devoted to women's work, also to that relating to cow-testing associations. In both, marked advance has been made.

Since my last report I have personally visited nearly the whole state twice in holding county conferences, those for this year having all been held, except in ten counties. In this and in other work connected with my bureau I have personally traveled during the year some 15,500 miles. I have participated in the Farmers' Week exercises of Cornell College, and of the secondary schools at Delhi, Morrisville, and Alfred; the State Fruit Growers' meetings both at Rochester and Poughkeepsie; the joint meeting of the state dairymen and breeders; and the annual meeting of the town and county agricultural societies, as well as many smaller gatherings.

The relations between farm bureaus and the farmers' institutes have continued to be very close. The farm bureau managers have rendered valuable assistance to my work in its various branches, and, so far as funds would permit, I have rendered service to the bureaus.

The report will show that we have had less help from the College of Agriculture and the State Experiment Station than in previous years. This does not indicate a lack of harmony or cooperation between these institutions and the Institute Bureau, for never were the relations closer. Because of increased burdens laid on these institutions, the outside work they can do is limited on the one hand; on the other hand, there was a lack of funds to pay expenses for this expert assistance.

In accord with your desire, expressed at the last normal institute, that the agricultural law should be explained to the farmers, as set forth on page 2259 of this report, the men in charge of the meetings have taken particular pains to explain the laws affecting the locality. I am sure this has been to the mutual advantage of the farmers and the Department of Agriculture. In response to requests, many copies of the agricultural law have been sent out. In this connection I would call your attention to the fact that no agency in your great department brings it in such close touch with the real farmers as does the Bureau of Farmers' Institutes, coming as it does into personal contact with representative men over the entire state.

I would commend the men and women that are connected with my bureau and engaged in the field work for their loyalty to the

work, for their ability as instructors in their several lines, and for their unselfish devotion to duty. Obligated to be away from home and business, often for long periods; with prolonged hours of continuous service that frequently extend far into the night; subjected to the discomforts of travel, and frequently to poor accommodations; taking long drives in all kinds of weather — for appointments must be met, even though heart and flesh fail — and being under a continual mental as well as physical strain, their names deserve to be written high among those who serve their fellow men.

The latter part of this report is devoted to the special work carried on at and in connection with Columbia University. Most of the lectures are published, not only because they contain valuable agricultural information, but to satisfy a demand from those in attendance and others who have read press abstracts that these lectures might be had for reference and study; and also because, so published, they extend the knowledge of and amply justify this most important branch of my work.

In spite of the handicap from bad weather already mentioned, and of the lack of anything startling, I consider the past year the most satisfactory of the four of my directorate. Thorough, systematic work has been carried on along all lines, the practical effect of which is clearly evident in agricultural practices over the state. The highest standards of citizenship have been held up and advocated, leading up to and emphasizing our motto for the year:

We are but farmers of ourselves: yet may,
If we can stock ourselves and thrive, uplay
Much — much good treasure for the great rent day.

— *Dr. Donne.*

NORMAL INSTITUTE

Following is program of the Seventeenth Annual Normal Institute, held at the New York State College of Agriculture, Ithaca, November 10, 11, and 12, 1915, with summary of the proceedings:

PROGRAM

WEDNESDAY

Room 210, Forestry Building

- 10:30 A. M. OPENING — Dr. Galloway.
RESPONSE — Director van Alstyne.
- 11:00 A. M. COST OF CROP PRODUCTION — Prof. Thompson.
- 1:30 P. M. FUNCTIONS AND PURPOSES OF THE DEPARTMENT OF AGRICULTURE —
Commissioner Wilson.
- 2:00 P. M. DISCUSSION OF SUMMARY OF FINDINGS OF AGRICULTURAL EXPERIMENT
STATIONS — Mr. Hall.
- 3:00 P. M. FERTILIZERS — Dr. Van Slyke and Prof. Cavanaugh.
(a) Treated Rock vs. Raw Rock and Basic Slag.
(b) New Forms of Soluble Nitrogen.
(c) Advice as to Potash.
(d) Undesirable Forms of Exploited So-called Plant Food.
- 4:00 P. M. TEN MINUTE STATEMENT AS TO THE FINENESS OF GROUND LIMESTONE —
Prof. McIntyre.
- 4:10 P. M. THE AGRICULTURAL LAW PERTAINING TO FARM LABOR AND FERTILI-
ZERS — Mr. Flanders.
- 7:30 P. M. MARKETING — Prof. Adams.
(a) Better Understanding of Consumer's End.
(b) Standardization of Products.
(c) Organization at Producer's End.
- THE PLACE OF THE FARM BUREAU IN AGRICULTURAL EXTENSION
WORK — Mr. Smith.

THURSDAY

- 9:00 A. M. CONFERENCE OF THOSE IN CHARGE OF MEETINGS.
- 10:00 A. M. REAL PROFITS FROM THE DAIRY BUSINESS.
(a) As Measured by Cost Accounting — Prof. Warren.
(b) Weighing of Milk and Feed — Prof. Savage.
(c) Indirect Profits — Prof. Stone.

- 11:00 A. M. ANIMAL HUSBANDRY — Dr. Jordan and Prof. Savage.
Has Undue Emphasis Been Laid on Protein?
- 2:00 P. M. SUGGESTIONS FOR BROADENING THE WORK OF COW-TESTING ASSOCIATIONS — Director van Alstyne.
- 3:00 P. M. MILK STANDARDS — Mr. Smith and Prof. Ross.
- 4:00 P. M. THE AGRICULTURAL LAW PERTAINING TO DAIRY PRODUCTS AND LIVE STOCK — Mr. Flanders.
- 7:30 P. M. COOPERATION
THE NECESSITY OF WORKING TOGETHER
(a) Educationally and Socially — Prof. Lauman.
(b) Financially — Prof. Lauman.
THE PLACE OF FORESTRY ON NEW YORK STATE FARMS.
(a) The Farm Woodlot — Prof. Hosmer.
(b) Reforestation of Hills and Farmed-out Lands — Mr. Paul.
(c) Economic Side of New York State Woodlands — Dean Baker.

POULTRY SESSIONS

Room 122, Forestry Building

THURSDAY

- 9:00 A. M. SOME FACTORS INFLUENCING THE DISTRIBUTION OF EGG PRODUCTION
THE CORNELL WIND BAFFLER FOR VENTILATING POULTRY HOUSES —
Prof. Rice.
- 9:30 A. M. MARKET DISTRIBUTION OF POULTRY PRODUCTS — Mr. Benjamin.
- 10:00 A. M. EXTERNAL CHARACTERS AS AN INDICATION OF EGG PRODUCTION
COMMON POULTRY DISEASES, SUCH AS WHITE DIARRHEA, COCCIDIOSIS
AND ROUP — Mr. Kent.
- 10:30 P. M. A COMPARISON OF DIGESTIBLE COEFFICIENTS FOR CATTLE, SWINE, AND
POULTRY AS SUGGESTIVE OF A BASIS ON WHICH TO COMPUTE POULTRY
RATIONS — Mr. Dann.

WOMEN'S CONFERENCE

Home Economics Building

THURSDAY

- 11:00 A. M. DIRECTOR'S CONFERENCE WITH WOMEN WORKERS.
- 11:30 A. M. WHAT SUBJECTS SHALL WE EMPHASIZE IN OUR WINTER'S WORK? —
Mrs. Jones, Dr. Heaton and Mrs. Morgan.
- 1:30 P. M. CONFERENCE: "Strengthening the Weak Places in Our Women's Sessions at the Institutes" — Led by Mrs. Harrington.
- 2:20 P. M. APPOINTMENT OF COMMITTEES TO REVISE QUESTION PAPERS AND
REPORT BLANKS.
- 2:30 P. M. HOW TO PRESENT THE SUBJECT OF VENTILATION — Miss Knowlton,
Dr. Heaton and Dr. Santee.
- 3:30 P. M. QUESTIONS AND DISCUSSION
- 4:00 P. M. HOME NURSING — Dr. Matzke.
- 4:30 P. M. DISCUSSION.

FRIDAY

- 10:00 A. M. HOME ECONOMICS AND THE STATE COLLEGE OF AGRICULTURE:
 (a) College Work in Home Economics — Prof. Rose.
 (b) Extension Work in Home Economics — Prof. Van Rensselaer.
- 11:00 A. M. DISCUSSION
- 11:15 A. M. BETTER FARM HOMES — Mrs. Monroe and Mrs. Jones.
- 11:45 A. M. DISCUSSION
- 1:30 P. M. QUESTION BOX — Answers by Members of Home Economics Department.
- 2:30 P. M. REPORT OF COMMITTEES.
- 3:00 P. M. LEARNING TO READ — Mrs. Phelps.
- 3:30 P. M. DISCUSSION.
- 4:00 P. M. GLORIFYING OUR WORK — Mrs. Morgan

FRIDAY

Room 210, Forestry Building

- 9:00 A. M. LEGUMES — Mr. Robertson and Mr. Barlow.
 (a) Vetch.
 (b) Sweet Clover.
 (c) Where Not to Grow Alfalfa.
- 10:00 A. M. STANDARDIZATION OF POTATOES — Prof. Stewart.
 (a) Disease Control.
 (b) Varieties.
 (c) Size.
- DISCUSSION — Led by Messrs. Forristall, Tillson, and Ross.
- 11:00 A. M. INJURIOUS INSECTS — Dr. Felt, Prof. Parrott, Prof. Crosby.
- 2:00 P. M. PLANT DISEASES — Prof. Stewart and Prof. Barrus.
- 3:00 P. M. FARM ORGANIZATION — Prof. Livermore.
 (a) Balance Between Crops and Stock.
 (b) Rotation.
 (c) Distribution of Labor.
- 4:00 P. M. THE AGRICULTURAL LAW AS IT RELATES TO PLANT DISEASES, FARM SEEDS, INSECTS, FOOD STUFFS, AND NOXIOUS WEEDS — Mr. Flanders

Auditorium of Women's Building

- 7:00 P. M. LUNCHEON — As guests of the Home Economics Department, followed by the reading of the Prize Essays on "Farm Management" and "Rotation of Crops" and presentation of awards, and informal suggestions for the work from Dr. Galloway, Dr. Jordan, Mr. Van Wagenen, Mrs. Harrington, and Director van Alstyne, interspersed with singing by Mrs. Morgan.

*Summary of Proceedings of the Seventeenth Annual Normal Institute
for New York State Workers*

THE COST OF CROP PRODUCTION

A. L. THOMPSON

In the production of a crop there are many factors of cost, all of which must be considered before one can arrive at a true result. Most of these cost factors are obvious, but quite often some of them, and too often some of the important ones, are disregarded.

In the first place, one should consider the cost of the seed. It makes no difference whether the seed is purchased or grown on the farm, it should be included at its value on the farm. Among other costs are manure, fertilizer and lime used by the crop. If a heavy application of lime or manure is made, part of the cost of this should be charged to the following crops. The proportion charged will depend upon the length of the rotation, the type of soil, frequency of the applications, and other factors. Since in some cases it is necessary to apportion the lime and manure charge over several years, some crops will have to pay for materials that have not been directly applied.

In addition to the above, the crop should pay for all man and horse labor performed on it, as well as its proportion of the machinery costs. The use of the land occupied by the crop is worth something, and a charge should be made for this. On most farms this rental, including taxes, amounts to about 6 per cent of the actual value of the land.

Usually the crops are stored in the barns. Whenever this is done the crop should pay for the use of that portion of the barn occupied by it. The charge for this should be enough to pay interest, taxes, insurance, repairs, depreciation, and any other expenses on the buildings. This usually amounts to about 8 per cent of the value of the buildings or space occupied.

In the production of most crops there will be numerous other costs, such as spray materials, twine, coal, threshing, hay pressing, and similar items. All these should be included. In some cases there is considerable money invested in a crop enterprise. When this investment extends over several months, as it does with some

crops, interest at the prevailing rate should be charged on this investment.

Not until all of these costs have been considered can a person arrive at the real cost of crop production. If one knows the value of the crop after it is produced he can go a step farther and determine the profit.

The Department of Farm Management in cooperation with the Office of Farm Management at Washington, D. C., is keeping cost accounts on about seventy farms in this state. The system used, originated by Dr. G. F. Warren, is one that requires the use of two books — ledger and work report. In the work report is kept a record of the hours of man and horse labor that are expended on each enterprise. At the end of the year the time spent on each crop is totaled, and each enterprise is made to pay for its proportion of the cost of man and horse labor. The machinery costs are distributed according to the hours of horse labor. In the ledger are kept all items other than the hours of labor, each enterprise being given a space. On the left hand pages all costs are kept; on the right hand side all returns. Having entered and totaled all the charges to the various accounts, the costs can be determined.

The following results have been obtained in this manner. They are from farms located in different sections of the state, and are from farmers' farms and not from rich men's estates. The results for each crop have been averaged. Since the results will vary with the seasons, figures for two years, 1913 and 1914, are given.

COST OF PRODUCING POTATOES

	1913		1914	
Number of farms.....	18	.....	21	.....
Number of acres.....	185.4	.....	158.8	.....
Average acres per farm.....	10.3	.....	7.6	.....
Average yield per acre in bushels....	102.7	.....	154.7	.....
<i>Cost of growing per acre</i>	<i>Amount</i>		<i>Amount</i>	
Seed.....	10 bu.	\$7 67	12.6 bu.	\$8 03
Fertilizer.....	412 lbs.	5 17	431 lbs.	5 72
Manure.....	.....	6 14	2.06 tons	4 64
Spray materials.....	.....	83	.....	80
Man labor.....	77.7 hr.	13 30	81.2 hr.	15 57
Horse labor.....	77.4 hr.	10 66	72.4 hr.	12 41
Equipment use.....	.....	3 58	.....	3 71
Use of land, at 6 per cent.....	.....	4 53	.....	5 18
Use of buildings, at 8 per cent.....	.....	1 27	.....	1 09
Interest, at 5 per cent.....	.....	.....	.....	88
All other costs.....	.....	63	.....	04
Total cost of growing.....	.....	\$53 74	.....	\$58 07

	1913 <i>Amount</i>	1914 <i>Amount</i>	
Cost of marketing per bushel.....	12	11,020 bu.	5
Cost of growing per bushel.....	52		38
Cost of growing and marketing per bushel.....	63		43
Profit per bushel.....	07		—10
Profit per man hour.....	08		—18

COST OF PRODUCING CORN

	1914	
Number of farms.....	12	.....
Number of acres.....	97	.....
Average acres per farm.....	8.1	.....
Average yield per acre in bushels.....	34.8	.....
<i>Cost of growing per acre</i>	<i>Amount</i>	
Seed.....	.4 bu.	\$0 42
Fertilizer.....	24.8 lbs.	32
Manure.....	1.6 tons	4 06
Twine.....	2 lbs.	21
Man labor.....	78.6 hrs.	13 37
Horse labor.....	57.3 hrs.	9 21
Use of equipment.....		2 87
Use of land, at 6 per cent.....		5 42
Use of buildings, at 8 per cent.....		98
Interest, at 5 per cent.....		88
All other costs.....		10
Total cost of growing.....		\$37 84
Cost of growing per bushel.....		1 09
Profit per bushel.....		—08
Profit per man hour.....		—04

COST OF PRODUCING SILAGE CORN

	1913		1914	
Number of farms.....	21	.....	18	.....
Number of acres.....	262.8	.....	225	.....
Average acres per farm.....	12.5	.....	12.5	.....
Average yield per acre in tons.....	6.3	.....	7.2	.....
<i>Cost of growing per acre</i>	<i>Amount</i>		<i>Amount</i>	
Seed.....	.35 bu.	\$0.89	.46 bu.	\$0 87
Fertilizer.....		6 41	105.5 lbs.	1 41
Manure.....		1 43	2.83 tons	5 51
Silo filling.....		24	3.2 lbs.	1 65
Twine.....		41.8 hrs.	39 hrs.	32
Man labor.....		59.4 hrs.	54.5 hrs.	6 15
Horse labor.....		3 04		8 62
Use of equipment.....		3 39		2 39
Use of land, at 6 per cent.....		10%	10%	3 77
Use of silo.....		1 52		1 67
Interest, at 5 per cent.....				81
All other costs.....		15		19
Total cost of growing.....		\$32 59		\$33 37
Cost of growing per ton.....		5 16		4 61
Profit per ton.....		—1 04		—12
Profit per man hour.....		—16		—02

COST OF PRODUCING CABBAGE

	1913		1914	
Number of farms.....	4	.....	9	.....
Number of acres.....	28.6	.....	74.8	.....
Average acres per farm.....	7.2	.....	8.3	.....
Average yield per acre in tons.....	5.2	.....	8.7	.....
<i>Cost of growing per acre</i>	<i>Amount</i>		<i>Amount</i>	
Seed.....	\$1 10		.74 lb.	\$2 47
Fertilizer.....	260 lbs. 4 93		392.7 lbs.	5 43
Manure.....	6 25		2.51 tons	5 35
Man labor.....	90.9 hrs. 14 31		68.9 hrs.	13 28
Horse labor.....	73.4 hrs. 10 44		54.3 hrs.	8 72
Use of equipment.....	2 88		.....	2 60
Use of land, at 6 per cent.....	5 20		.....	5 14
Use of buildings, at 8 per cent.....	35		.....	03
Interest, at 5 per cent.....	18		.....	79
All other costs.....	18		.....	38
Total cost of growing.....	*\$45 64		.....	\$44 19
Cost of marketing per ton.....	.....		.589 tons	1 44
Cost of growing per ton.....	.....		.....	5 06
Cost of growing and marketing per ton.....	8 71		.....	6 50
Profit per ton.....	11 47		.....	76
Profit per man hour.....	66		.....	07

COST OF PRODUCING BUCKWHEAT

	1913		1914	
Number of farms.....	7	.....	8	.....
Number of acres.....	75.6	.....	59.5	.....
Average acres per farm.....	10.8	.....	7.4	.....
Average yield per acre in bushels.....	14	.....	18.7	.....
<i>Cost of growing per acre</i>	<i>Amount</i>		<i>Amount</i>	
Seed.....	1.5 bu. \$1 42		1.2 bu.	\$1 15
Fertilizer.....	.....		12.6 lbs.	18
Manure.....	.....		.06 tons	12
Threshing.....	48		.....	74
Twine.....	14		.....	06
Man labor.....	20.4 hrs. 2 93		23.1 hrs.	3 67
Horse labor.....	37.5 hrs. 5 45		36.7 hrs.	5 47
Use of equipment.....	1 49		.....	1 31
Use of land, at 6 per cent.....	2 53		.....	2 91
Use of buildings, at 8 per cent.....	48		.....	74
Interest, at 5 per cent.....	.....		.....	24
All other costs.....	.....		.....	07
Total cost of growing.....	*\$18 52		.....	\$16 66
Cost of marketing per bushel.....	.....		323 bu.	03
Cost of growing per bushel.....	.....		.....	82
Cost of growing and marketing per bushel.....	1 32		.....	85
Profit per bushel.....	—45		.....	—08
Profit per man hour.....	—31		.....	—07

* Includes marketing.

COST OF PRODUCING OATS

	1913		1914	
Number of farms.....	27	.....	28	.....
Number of acres.....	474.3	.....	368.6	.....
Average acres per farm.....	17.6	.....	13.1	.....
Average yield per acre in bushels....	35.1	.....	29.4	.....
<i>Cost of growing per acre</i>	<i>Amount</i>		<i>Amount</i>	
Seed.....	2.3 bu.	\$1 20	2.4 bu.	\$1 28
Fertilizer.....	} 5 57	{	136.3 lbs.	1 46
Manure.....			1.73 tons	3 66
Threshing.....				91
Twine.....		20	2.3 lbs.	23
Man labor.....	21.9 hrs.	3 59	19.6 hrs.	3 45
Horse labor.....	30.8 hrs.	4 59	27.3 hrs.	4 62
Use of equipment.....		1 59		1 24
Use of land, at 6 per cent.....		3 83		4 30
Use of buildings.....		69		85
Interest, at 5 per cent.....				50
All other costs.....		18		18
Total cost of growing.....		\$22 34		\$22 68
Cost of growing per bushel.....		53		65
Profit per bushel.....		—08		—13
Profit per man hour.....		—13		—19

COST OF PRODUCING WHEAT

	1913		1914	
Number of farms.....	5	.....	11	.....
Number of acres.....	38	.....	136.8	.....
Average acres per farm.....	7.6	.....	12.4	.....
Average yield per acre in bushels....	27.4	.....	23	.....
<i>Cost of growing per acre</i>	<i>Amount</i>		<i>Amount</i>	
Seed.....	2.1 bu.	\$2 56	1.8 bu.	\$1 71
Fertilizer.....	} 8 90	{	166 lbs.	1 68
Manure.....			1.42 tons	3 16
Threshing.....				90
Twine.....		38	2.5 lbs.	25
Man labor.....	23.7 hrs.	5 05	21.8 hrs.	4 10
Horse labor.....	41.5 hrs.	5 55	32.4 hrs.	4 81
Use of equipment.....		1 40		1 44
Use of land, at 6 per cent.....		3 95		4 99
Use of buildings, at 8 per cent.....		29		86
Interest, at 5 per cent.....				84
All other costs.....				15
Total cost of growing.....		*\$29 17		\$24 89
Cost of marketing per bushel.....			1,713 bu.	05
Cost of growing per bushel.....				91
Cost of growing and marketing per bushel.		1 06		96
Profit per bushel.....		02		19
Profit per man hour.....		03		19

* Includes marketing.

COST OF PRODUCING HAY

	1913		1914	
Number of farms.....	23	.....	32	.....
Number of acres.....	823.7	.....	1306.5	.....
Average acres per farm.....	35.8	.....	40.8	.....
Average yield per acre in tons.....	1.44	.....	1.28	.....
<i>Cost of growing per acre.....</i>	<i>Amount</i>		<i>Amount</i>	
Seed.....	\$1 07		.12 bu.	\$0 80
Fertilizer.....	2 78	{	15.7 lbs.	15
Manure.....			.9 tons	1 84
Man labor.....	10.2 hrs.	1 69	8.3 hrs.	1 39
Horse labor.....	9.7 hrs.	1 40	8.3 hrs.	1 33
Equipment use.....		49		37
Use of land, at 6 per cent.....		3 67		4 11
Use of buildings, at 8 per cent.....		1 00		97
Interest, at 5 per cent.....				20
Miscellaneous.....		01		03
Total cost of growing.....		\$12 11		\$11 19
Cost of marketing per ton.....	78.7 tons	2 09	236.8 tons	2 60
Cost of growing per ton.....		8 41		8 73
Cost of growing and marketing per ton...		10 50		11 33
Profit per ton.....		2 80		3 83
Profit per man hour.....		37		54

These results are at variance with public opinion. Profits from farming, or any other occupation, will depend upon various factors, and one of the important factors affecting profits is the method used in figuring. If only the cash costs of production are included one conclusion will be reached; while, if all costs are included, another and a widely different conclusion will be reached.

Any person using figures obtained from cost accounting methods should thoroughly understand them before drawing any conclusions. If the results from a farm show that the profits on the crops and animals have been 0, it does not mean that the farmer has lost money. Before any enterprise shows a profit by cost accounting methods it must first pay all cash costs — for all labor, both man and horse, for use of the land, buildings and machinery, and all other costs. This means that the farmer has paid wages for all his time, and interest on his investment. A farmer who is breaking even on his crop and animal enterprises is doing as well as a man making a labor income of approximately \$400.

If one finds that he is losing money on any crop enterprise, it does not necessarily follow that he should discontinue that crop. The season may have been unfavorable, the market may have been

especially poor, or there might have been other conditions that prevented that particular year from being a normal one. Assuming that the year was as good as one could normally expect, there are yet reasons why a farmer might find it to his advantage to continue growing an apparently unprofitable crop. Suppose, for example, that the oat crop on a particular farm shows a loss of \$2 per acre and that labor costs 20 cents per hour. Oats normally require about 20 hours of man labor per acre so that a loss of \$2 per acre means a loss of about 10 cents per hour. This means that while working on oats the producer receives $\frac{1}{2}$ wages or 10 cents per hour. If the work on oats comes at a time when one would otherwise be idle, or if there is no more profitable work that could be substituted, then growing oats is desirable. While growing oats the farmer is getting 10 cents per hour for his time and full pay for the work done by his horses, full rent for his land and buildings, and pay for all other expenses. Aside from the standpoint of labor distribution, the crop may utilize the land to better advantage, it may improve the rotation, furnish straw for bedding at a lower cost than it could be purchased, or answer other purposes.

Results secured by cost accounting methods on the cost of crop production are valuable. They furnish reliable figures, and these figures are relative, so it is possible to compare different crops on the same farm; but these figures are not final. Cost of production, while important, is only one of several factors that should be considered in deciding whether or not one should grow any particular crop.

FUNCTIONS AND PURPOSES OF THE DEPARTMENT OF AGRICULTURE

COMMISSIONER CHARLES S. WILSON

INTRODUCTION

This conference of institute workers with the scientists at Geneva and Cornell is for the purpose of acquainting the institute workers with the information which has accumulated as a result of recent scientific research. In addition, our department representatives get the enthusiasm and inspiration which naturally results from a meeting of this kind.

PURPOSE OF THE INSTITUTES

The item in the Appropriation Bill providing funds for the institute work reads as follows:

For maintenance and extension of farmers' institutes held under the auspices of the commissioner of agriculture, and for holding farmers' educational meetings and demonstrations and cooperating with the State College of Agriculture and other institutions and organizations including inspections of and recommendations concerning farms connected with state institutions as provided in the agricultural law, to be paid on the order of the commissioner of agriculture and certified in sums as needed and for which vouchers for expenditures duly audited and verified by him shall be rendered, thirty thousand dollars.

The institute work has been carried on by the state of New York for twenty-nine years, this season's work making the thirtieth. During this time it has grown, and grown rapidly too, until the work has extended to all parts of the state of New York. Last year it reached 111,306 people. There were held in 1914-15:

Institute meetings.....	450
Institute schools.....	5
Total sessions.....	1,305
Total attendance	111,306

Through all these years the character of the institutes has been, in the main, educational. They have done, and are doing, valuable work. In the last thirty years agriculture has developed and progressed in a marked degree. Recently extension schools conducted by the New York State College of Agriculture at Cornell University have sprung up. The institutes and the schools each perform their proper function, the schools occupying

the more technical field and the institutes the more general. There is no conflict between the two; there is no duplication of work. The two agencies are working together harmoniously and cooperatively.

INTRODUCTION OF A NEW FEATURE — THE AGRICULTURAL LAW

It has been stated that the institutes have outlived their usefulness — that there is no longer a need for work of this character. I agree that the institute work of today is not the same in character as that of twenty years ago, but I do not agree with those who believe that the institutes should be abolished. I do believe, however, that the institute work should progress and develop together with, and perhaps in advance of, the progress and development of agriculture, and I think an opportune time has arrived to introduce a new feature into the institute work — or perhaps I should say, to revive a dormant feature. That feature is the dissemination of information in regard to the agricultural laws of the state of New York.

As stated above, the function of the institutes hitherto has been to impart technical information. The conductors or speakers may have called, and probably did call, attention to the laws of the state — to the dairy law in a dairy section, to the nursery laws in a fruit section, etc. But no systematic effort has ever been made to instruct the farmers definitely in regard to the provisions of the laws. I am wondering how many of the institute workers themselves are familiar with the provisions of the laws sufficiently to make a creditable, clear and legal explanation.

The primary function of the Department of Agriculture is regulative — to enforce the agricultural laws of the state of New York. The institute workers are representatives of this department, and this winter it is planned to have the institute speakers explain to the farmers the agricultural laws.

IGNORANCE OF LAW A GENERAL PLEA

One of the difficulties of the department is the plea of ignorance on the part of the violators. In particular was this brought out in connection with the enforcement of the new apple grading law. Mr. Atwood informs me that in 95 per cent of the violations the defendant has stated that he knew nothing of the law, or did not

understand its provisions. Of course evidence of this kind has a tendency to weaken our case. This plea of ignorance is made in violations of the other laws as well as the apple packing law.

There are two ways of enforcing our agricultural laws: first, by hiding for the purpose of catching someone whom you at once fine \$50 or \$100; second, by educating the public in the regulations of the state, at the same time requesting their cooperation in the enforcement of the law. I like the latter, and, while I do not intend to abandon the former method, I wish to emphasize the educational method.

AVAILABLE AGENCIES FOR EDUCATIONAL WORK

In addition to the press, the Department of Agriculture has three available agencies for educational work of this kind:

1. Through the agents in the field. Each year copies of the individual laws are printed and sent to the agents, who distribute them to the best of their ability. An agent in the city of Rochester, for example, leaves a copy of the pure food law with every retailer of pure food, with a request that such retailer examine its contents. A record is made of the fact that this agent left a copy of the law with the said retailer on a given date, and such record is filed in the department. If this retailer is found later to be a violator, the plea of ignorance loses much of its weight.

2. Through the county fairs. If the Department of Agriculture could place its exhibit at some of the county or town fairs it would be able to disseminate, through these organizations, information regarding the law. No definite or systematic work in this line has been attempted as yet.

3. By means of the institutes. Of the three agencies mentioned, it seems to me that the Farmers' Institutes are the most effective to inform the public regarding the provisions of the law. Last year the institutes reached over 111,000 people in the state of New York.

SUGGESTIONS FOR INSTITUTE WORKERS

It seems to me that the opportune time has arrived to start a campaign to instruct the public in the provisions of the law, and such a campaign is planned for the institute workers this winter. At every institute I want the department representatives to call attention to the laws which concern the people of that locality.

It will not be necessary always to interpret the law, and perhaps this would be unwise. But you can say — in a fruit-growing section, for instance — that there is, on the statute books of the state of New York, a law regulating the grading of apples. It might be well to point out the main provision or provisions of that law, keeping in mind the fact that you should always be certain that you have given those provisions correctly. You should also add that there are other provisions of the law which the grower should not overlook.

It might be well to call for questions. Probably the best way to answer these questions would be by reading that portion of the law pertaining to the questions. Whatever your answer or explanation may be, be absolutely certain that you are right as regards legal interpretation. If you do not know, or if in doubt, take the person's name and forward the question to the Department at Albany, and I promise you that your request will have immediate attention.

I realize that you are not lawyers, but I want you to appreciate legal accuracy and to realize that whatever you say must be in accordance with the law. To my mind it does you no harm to say that you do not know but will find out. On the other hand, it certainly will do you harm, and bring discredit to the department, if you try to bluff.

In every meeting where such reference is made to this or that law, I want the conductor to make a record of that fact and forward that record to the Commissioner at Albany. This is evidence which the Commissioner can use in case of violations of these particular laws in that locality.

There have been forwarded to you copies of the revised law, which is published as Bulletin 72. I am going to ask you to study carefully all articles relating to the work which you are presenting. I have asked Mr. Flanders to attend this institute, and you will notice that he appears on the program at the close of each group of subjects. He has done this at my request to bring out the legal points while the subject is fresh in our minds. This is a new feature of the institute work which, in my mind, is extremely important; and I hope that you will undertake it in the spirit of hearty cooperation and try your very best to accomplish results.

Institute workers are representatives of the Department of Agriculture, and they should keep this fact clearly in their minds at all times. Everything they say, therefore, whether technical or legal, must be in accordance with the law of the state of New York, and the attitude of the institute workers must be one of loyalty to that law. The law is our guide. In all probability some farmer will rise up in an institute meeting this winter and say that he "has it in for" the Department of Agriculture because the Commissioner has eliminated the games and some of the shows at the county fairs. He will probably say that he believes, and many other people believe, that this is unreasonable. Explain to such a person that the Commissioner, in doing that, was simply enforcing the law of the state; whether reasonable or unreasonable, it was law, and that all loyal citizens should be glad to comply with that law.

Again, some fruit-grower may criticise the department because it requires the producer to brand a barrel of apples put up "tree-run" and sold as such to a dealer, who immediately puts them in storage for repacking later. He thinks this unjust and blames the Commissioner of Agriculture. Explain to him that whatever the merits of the case may be, the law requires such branding, and that the Commissioner of Agriculture in enforcing the law is only doing his duty. At all meetings the institute workers should try to create a spirit of loyalty toward the laws of the state, and a willingness on the part of the public to cooperate in the enforcement of those laws.

CONFLICTING IDEAS

Occasionally the fact is brought out at the Normal Institutes that scientific experts disagree as regards their recommendations, or the opinion of an institute worker may not be in accord with the recommendation of a scientist. The fact that two scientists may disagree does not necessarily mean that one or both are wrong; usually after research has disclosed all the truth both have been correct. But as institute workers these differences of opinion must be faced, and I want you to take this attitude: wherever scientists disagree, or your opinion differs from theirs, say nothing, unless it is necessary to answer a definite question on

the subject. In that case, without mentioning names, merely state the facts on both sides of the question, and in no case express your own opinion.

TO THE FARM BUREAU AGENTS

I wish to take this opportunity, at a gathering where the county agents are assembled, to express a caution; and I do this because the state apportions, through the Department of Agriculture, six hundred dollars annually for the work or salary of each county agent. In some cases I feel that the county agent, in his enthusiasm for his own county, sees no further than the boundary of that county. He forgets the fact that he is also a servant of the state and the federal government, and that there is not the hearty co-operation with the state department that there ought to be.

In some cases where departmental matters affect an individual or individuals in a county, the county agent has taken the side of the individuals in his county, thus openly opposing and defying the Department of Agriculture, of which he is a part. Generally there are two sides to the question, and the better attitude for the county agent to take would be to communicate directly with the Commissioner of Agriculture; or, if possible, come immediately to Albany in order that he may get the facts on both sides. Sometimes it happens that in taking the side of his county, the county agent is not serving the best interests of his constituents, and certainly he is hindering the work of the department.

Again, in some cases there is not hearty cooperation between the representatives of the department in the field and the county agent. Instead of working together they are working against each other. Such actions should not be permitted; and, where these differences arise, the county agent and the department's agent should come directly to Albany, where, together with Mr. Burritt, the differences may be adjusted. If the department representative is at fault, you can be assured that the error will be corrected; if the county agent is at fault, it is best for him to know it.

CONCLUSION

I do not want to be misunderstood in what I have said this afternoon, especially in regard to my suggestions for the institute workers. Because I have mentioned the legal side only is no in-

dication that I disapprove of the technical work. I approve of everything the institute workers have done and are doing. I might say many things in praise of the institute work. My suggestions as to the legal work have been made in the hope that this will be added to the work already developed, and which is accomplishing such good results.

I want also to assure the institute workers that the department is back of them and wants to help them in every way possible. Do not hesitate to write to the Albany office for information or suggestions. In closing, I express the wish that the institutes this year may be more successful and efficient than they have ever been in the past.

NOTES ON SOME RECENT STATION BULLETINS

F. H. HALL

These notes are in no way intended to be a complete review of the work of the experiment stations in the United States for the past year; but merely to call attention to some pieces of work which have a bearing on New York agriculture. The summaries given should serve merely as texts for full discussion of the topics mentioned.

No notes are given on publications of the stations in New York State, as the matters therein presented will undoubtedly be brought to the attention of the institute by the investigators.

BACTERIOLOGY

Nodule bacteria. (Ky. 184.) From studies and cultures the author regards the bacteria producing nodules on alfalfa, clover, vetch and garden pea, cowpea, soy bean and garden bean as distinct and not interchangeable for the purpose of promoting nitrogen assimilation by these crops.

Comparative effect of phosphates and sulphates on soil bacteria. (Wis. Research 35.) Studies were made of certain chemical changes in culture media, in soil solutions and in soil as influenced by the development of bacteria therein, and of the effect on these changes produced by the addition of the chemicals, in pure form, which are the effective ingredients in fertilizers.

The investigators conclude that the addition of mineral fertilizers to soils causes an increase in the production of ammonia and carbon dioxide, and in the number of bacteria. They say: "The results of this work suggest that possibly the increased crop production of a soil resulting from the application of soluble phosphates is in part due to the promotion of bacterial activity. On the one hand, by the increased ammonification and consequent conversion of ammonia into nitrates, more nitrogen becomes available for rapid plant growth. The increase in carbon dioxide favors the solution of the insoluble minerals of the soil and thus helps to render available those mineral constituents needed for plant food."

"The sulphates * * * will not, in all probability, have the same general crop-producing power as the phosphates, because of the difference in the effect that the two acid radicals have on soil flora."

CHEMISTRY, SOILS AND FERTILIZERS

A new test for soil acidity. (Wis. 249.) Simplicity, accuracy and reliability in comparatively untrained hands are claimed for this test. It rests on the principles that acids will set free hydrogen sulphide gas when they act on zinc sulphide, and that this gas will blacken, in proportion to the amount evolved, a paper soaked in lead acetate. The reaction is thus a positive one easily judged by the eye and the discoloration compared with a standard; so that a very reliable indication is given not only of the presence of acid, but of the amount in the soil.

Value of different sources of phosphorus. (R. I. 163.) This bulletin discusses three experiments, extending over six, seven and twenty years respectively, in which various sources of phosphorus for improving soil fertility were compared under varying conditions.

In the first, or six-year test, ground bone, guano and dissolved rock phosphate produced yields in the order mentioned, each less than the one above by about 300 pounds, or nearly 4 per cent. The phosphorus was provided in equal amount by each material, and the nitrogen and potash in the guano were balanced by supplements of nitrate of soda and muriate of potash added to the bone and rock. Some of the soils were too acid to give the best yields of all the crops grown.

In the seven-year test results were held to be inconclusive, since the phosphorus supply was not the only controlling element of plant growth.

The third experiment ran for twenty years, on limed and unlimed soils, the phosphorus being made equal in cost on the different series for five years, then gradually changed to equal weights, a condition secured in three years. During the last ten years no phosphorus was added, in order to allow study of the residual effect of the previous applications.

At the end of the equal-cost period the different sources had given yields in the following order, from highest to lowest: Thomas

slag and ground bone superior to dissolved bone black and dissolved bone on unlimed plats, the reverse being true on limed plats; acid phosphate ranked fifth on both limed and unlimed soils, being markedly superior to the raw rock phosphate or floats.

At the end of ten years, when the applications had supplied equal amounts of phosphorus on all plats, the phosphorus in Thomas slag, ground bone and dissolved bone seemed of the greatest, and nearly equal, availability on both limed and unlimed soils, though the acidity-correcting power of the Thomas slag was partly responsible for its favorable action on the unlimed plats, and the nitrogen in the bone may also have been a factor. Dissolved bone black and dissolved rock followed the three materials just mentioned and were again considerably superior to the raw ground rock.

At the end of the twenty years, the effect of the applications of phosphorus made more than ten years before were still evident on all plats except those of raw Redonda phosphate, particularly on the limed soil. The figure at this time left the rank of the sources practically unchanged on the unlimed plats, but on the limed plats the dissolved bone black had shown equal efficiency with the Thomas slag, ground bone and dissolved bone. The acid phosphate (dissolved rock) holds an intermediate place on both limed and unlimed soils, being decidedly superior to raw rock, double superphosphate, or roasted or raw Redonda phosphate. The double superphosphate requires lime to be effective, ranking next to acid phosphate on limed soils, but below raw rock on the unlimed plats. The roasted Redonda phosphate behaved similarly to the double phosphate but was not of as great value, and the raw Redonda phosphate was valueless, or even deleterious on limed soil.

Because of its relative cheapness, raw rock, on cost basis only, ranks with the Thomas slag and bone; but owing to the smaller crops produced it suffers in comparison with the better phosphates when all cost factors are considered.

Where no phosphorus was used, nine tons of slaked lime per acre in three applications, eight or nine years apart, resulted in crop increases during twenty years valued at \$400 per acre; with insoluble phosphates, ground bone, Thomas slag, raw rock

and raw Redonda the increase was \$330 or less; and with the other phosphates the increase varied from \$442 with the dissolved rock to \$590 with the double superphosphate.

Phosphates in Massachusetts agriculture. (Mass 162.) Massachusetts soils show a much less marked deficiency in phosphorus than those of states in the corn belt, though the supply is usually not great enough to insure maximum crops. The cropping systems generally employed in the state are not depleting the soil of phosphorus since: (1) The products sold carry relatively small amounts of phosphoric acid; (2) the grain and by products fed contain large amounts of phosphorus which makes its way, with little loss, to the soil in farm manures; (3) commercial fertilizers are freely used, especially in market gardening, which contain large proportions of phosphorus; (4) phosphorus does not leach from the soil in any considerable amount.

The use of phosphorus-containing materials as fertilizers is generally profitable in the state; and the dissolved phosphates have given larger returns and greater profits than the fine-ground raw rock. Although 1,600 pounds to the acre of phosphoric acid in the form of raw rock has been applied to a series of plats in experiments extending over eighteen years, the plats are yielding proportionately smaller crops, as compared with those on plats receiving dissolved phosphates, than in the first years of the tests. The dissolved phosphates appear to stimulate early and rapid growth of both root and top; to lead to earlier and more perfect maturity, and, according to the work of other experimenters, to increase tillering of grain and grasses; to promote availability of some other important soil constituents; to induce activity of nitrifying organisms in the soil; and to stimulate micro-organisms which assimilate nitrogen from the air.

This bulletin is an important contribution to a very much discussed phase of agriculture, and should be studied before adoption of methods recommended by western agronomists.

Potassium from the soil. (Ill. 182.) Investigations made in pots, under carefully checked conditions, apparently indicate that "potassium can be liberated as needed from the inexhaustible supply naturally contained in the normal soils of Illinois." Clover takes up from two to three times the amount of potassium

needed for its growth; and by incorporating the clover in the soil (green manuring), potassium which the chemist finds insoluble by present methods, and regards as of no fertilizing value, may be made readily available.

The decay of other organic matter, like manure, also releases the "locked-up" potassium in the soil.

Sulphur and soil fertility. (Ky. 188.) Sulphur or gypsum in addition to a complete fertilizer gave a decided increase in growth of Yellow Pryor tobacco. Different sulphur compounds applied to the soil resulted in increased growth of soy beans, the best effect being produced by sulphur itself. Turnips were materially benefited by the use of sulphur fertilizers. Clover, however, was not benefited by sulphur compounds except potassium sulphate, and the result there may have been due to the potassium. On cabbage, sulphates of iron, nickel, copper, cobalt, chromium, manganese, lithium, etc., were compared with carbonates of the same materials. Only two of the sulphates were beneficial, a few had no effect and several were harmful. Mustard following the cabbages showed gains over the check plots from several of the sulphates, and all gave better results than the corresponding carbonates. Radishes on the same plots gave irregular results, but there is no doubt that the sulphur fertilization was beneficial in some cases.

With alfalfa in sand cultures, better growth was secured from the use of nine out of fifteen sulphates than from carbonates of the same elements.

Radium as a fertilizer. (Ill. 177.) Radium applied at a cost of \$1, \$10 or \$100 per acre produced no effect upon crop yields either the first or second season.

Utilization of septic tank sludge. (Cal. 251.) This is a plea for the utilization of human excreta and other household wastes as collected in some of the sewage disposal systems, and is well worth study, although no very definite methods are outlined nor costs computed for handling such materials.

How not to treat Illinois soils. (Ill. Circ. 181.) This lecture before the Illinois State Farmers' Institute is a plea for use of single or united fertilizer elements, generally phosphoric acid, occasionally potash, with liming, for soil improvement, rather than

the use of mixed commercial fertilizers — with special reference to the “Try-a-Bag” propaganda. Much valuable and interesting experimental work is here summarized to bring out the importance of judicious rather than indiscriminate use of fertilizing materials.

Improving Iowa peat and muck soils. (Iowa, 157.) The investigations were confined to the shallow peats, not over four feet in depth, as the deeper deposits are commercially valuable as fuel. These beds are underlaid with clayey or muck subsoils, which are rich in potassium and contain some phosphorus, so that the lack of these two elements in the peat does not greatly restrict crop production. As limestone, gypsum, phosphorus or potassium applied alone or in combination gave no profitable increases in series of tests at three places, the authors conclude that the shallow Iowa peats do not need the addition of commercial fertilizing materials to make them productive, but do need physical improvement, involving adequate drainage, proper plowing and cultivation, and choice of crop best suited to such soils. Thorough underdraining is necessary, with properly placed and properly sized outlets to remove surplus water and to care for flood waters from surrounding areas. Deep fall plowing is advocated, with frequent cultivation. Timothy and alsike is perhaps the best crop for reclaimed peat, while corn and small grain usually do not do well for several years. Vegetables, such as onions, celery, tomatoes, potatoes, etc., often give excellent returns on such soils.

Kentucky Station teachings on soil fertility. (Ky. 191.) In general, these teachings are: (1) That Kentucky farmers should purchase as little nitrogen as possible, but secure this element by the growth of legumes, after making conditions favorable by the use of limestone and phosphorus, where necessary. (2) That most of the soils of the state, except in the Bluegrass region, are low or deficient in phosphorus, which element should be supplied in the form of acid phosphate until the humus content of the soil can be improved, after which raw rock phosphate is most economical. (3) That potassium exists in exhaustless store in most of the soils of the state, and that it may be made available in amount sufficient for the growth of good crops by the use of legumes, limestone and phosphorus. Special soils like muck and

peaty loams require added potassium. (4) That complete fertilizers, if used at all, should be purchased in the form of high-grade brands. (5) That limestone should be used freely on acid soils to promote the growth of legumes; but that where soils lack phosphorus the use of limestone alone is not profitable, though of great profit when used with phosphorus-supplying materials.

CULTIVATION AND FIELD CROPS

Effect of liming on clover production. (Mass. 161.) Biological notes and chemical analyses were made of clover grown on limed and unlimed plats, the history of which was known for many years.

Liming increased the size of the clover plants and increased the percentage of nitrogen in them when the clover was grown on soils without an application of nitrogen, or when supplied with sulphate of ammonia. This effect was apparently due to the action of lime on the soil, making it more suitable for the plants, rather than to any effect within the plants themselves.

Stalks per hill and yield of corn. (Minn. 149.) From a canvass of a large number of growers, the author found that the great majority desired 3 stalks per hill and secured an average of 2.93 stalks, while only a very few fixed their choice on either fewer or more stalks in the hill. To ascertain whether this preference was justified, tests were made at the station for five years with one stalk in hills 18 inches apart in drilled rows 3 ft. 8 in. apart, and 2 to 6 stalks in check row hills 3 ft. 8 in. apart. Extra kernels were planted to secure the desired number of stalks, the unnecessary ones being removed when the plants were about 6 inches high. Very full data were secured of the yields, including barren stalks, percentage of stand at harvest, height of stalks, height of ears, weight of ears and of stover, and total and acre yields. The number and the percentage of barren stalks increased with the number of stalks in the hill, but the differences in percentage stands at harvest were not significant. The largest yield of bushels of corn came from 4-stalk hills, followed closely by the 5-stalk hills, but the percentage of marketable ears decreased regularly with the increase of the number of stalks, so that the 3-stalk hills gave the highest yield of marketable ears,

with the 2-stalk hills following closely and the 4-stalk and 1-stalk hills ranking third and fourth with distinctly smaller yields.

The amount of stover was lowest with the 2-stalk hills and increased with the number of stalks in the hill, but the 1-stalk hills in drilled rows produced practically the same amount as those with 3 stalks in check-row hills.

Corn cultivation and yields. (Minn. 149.) In tests extending over three years, one plat for the growth of corn received no cultivation after planting, the weeds being allowed to grow undisturbed; the remaining five plats were harrowed once after planting and one was hoed enough to keep the weeds down, while the others were cultivated two, three, four or six times, respectively. The weed plat produced only 9 bushels of corn and a ton of stover per acre; the plats cultivated two or three times, 46 and 48 bushels of corn and 3,200 and 3,750 pounds of stover, respectively; those cultivated 4 or 6 times gave 59 and 63 bushels of corn, respectively, and practically 2 tons of stover apiece; while the hoed plat yielded 64 bushels of corn and $2\frac{7}{8}$ tons of stover.

Although the hoed plat gave the largest yield, the author would not recommend such practice because of its cost, though he does not give figures. He maintains that the four hoeings were equivalent to so many shallow cultivations. He, therefore, holds that, except in years of great drouth when additional cultivations to maintain a dust mulch may be advisable, four cultivations (twice each way) as shallow as possible, will give the best results on comparatively heavy loam.

Soil moisture and tillage for corn. (Ill. 181.) The authors specifically state that they are not recommending hand for machine labor in corn cultivation, yet their results show that removal of weeds with slight soil disturbance—that is, scraping with a hoe—on brown silt loam gave an average increase in yield, for 16 tests in eight years, of 17.1 per cent over ordinary cultivation; while on gray silt loam on tight clay subsoil the hoeing gave a very slight increase over ordinary cultivation. The principal advantage in any cultivation for corn is removal of the weeds, which rob the corn of plant food and light. The question of moisture is of less importance, since when the corn is well established the roots so fill the soil that little moisture can escape. Cultivation,

when not exceedingly shallow, prunes off many roots and makes quite a portion of the soil unavailable to the plant as a feeding ground.

Thorough preparation of the seed bed, on brown silt loam, gave an increase of $14\frac{1}{2}$ bushels to the acre over no seed bed, and on gray silt on tight clay, $21\frac{1}{2}$ bushels; killing weeds gave increases of 38.6 bushels and 21 bushels, respectively, on the two soils.

Subsoiling and deep tilling tests did not indicate sufficient advantage from these processes to justify their use; and in some cases they appeared to be detrimental to the corn.

Corn experiments. (Ohio, 282.) During the past five years many experiments in corn cultivation have been made by the Ohio Station, and these, with much previous work, are summarized in this bulletin to make practically a manual of corn culture.

A five-year rotation has been found much better than continuous cropping with corn, and a three-year rotation better than the five-year. The use of manure alone has given much larger yields than the use of acid phosphate alone, and the use of the two together larger increases than the sum of the gains from the two separately. Liming has increased the yield of corn considerably, most on unfertilized plats, and has produced gains through the rotation worth nearly three times the cost of the lime. Some gain has resulted from deep plowing, but more from subsoiling, though not enough to make either operation very profitable.

In distance experiments one plant every foot in the row has given better results than three plants in hills one yard apart, but the maximum yields have been secured from four plants in hills three and one-half feet apart each way.

Shallow cultivation has been superior to deep cultivation, and late working with one horse cultivators has given profitable increases in yield. Difference in ear length of seed corn has not materially affected the yield; seed from tapering ears has produced more than that from cylindrical ears, and ears with filled tips have been slightly better as sources of seed than those with bare tips. Little difference has been shown in results from butt, middle or tip kernels, and from ears with 14, 16 or 18 rows of kernels.

Selection has easily lowered the ears on the stalks, and earliness accompanies low ears. Ear-row tests and subsequent crossing of best ears make it possible to increase yields 5 to 10 bushels per acre but not much beyond this point.

An average gain of nearly 4 bushels has come from the use of individual ears given a germination test; a return of about \$6.50 an hour for the time spent in test.

Soy beans. (Conn. [State] 185.) Soy beans are better adapted to Connecticut than cowpeas, since they are more resistant to drought, heat and frosts, are upright in habit and therefore easier to handle, and they yield more seed, which is all ripe at one time and is a more concentrated feed. The yields range from 1.6 to 3.1 tons per acre of dry matter, as compared with yields of corn at the same places, of 3.9 to 5.0 tons; but the soy beans average 670 pounds to the acre of digestible protein, while corn produces less than half this amount.

The earliest varieties, blooming in 55 to 60 days and then fit for soiling, were, in order of yield of forage, Manhattan, Medium Yellow Quebec and Ito San; the medium early varieties, blooming in 62 to 75 days, were Ebony, Wilson, Medium Green, Kentucky and O'Kute; and the later varieties, Arlington, Cloud and Swan. The later varieties, as a rule, are heaviest producers of forage.

Hollybrook was grown in an unfavorable location, but is considered one of the best varieties.

Mulched potatoes for seed. (Nebr. 146.) During eight years' work, 22 experiments, seed potatoes grown under a mulch of coarse material were compared with seed grown under other conditions. In ten tests where the seed tubers had been grown for only one year under each method, for each 100 pounds of tubers grown from mulched seed, the cultivated seed produced from 62 to 93 pounds only, with an average of 77.3 pounds. From all the 22 tests it appears that the difference in favor of the mulched seed increases with the time the other seed has been cultivated, ranging from 77 pounds from seed cultivated one year to 54 pounds for seed cultivated eight years, as compared with 100 pounds from mulched seed. The mulch-grown seed has out-yielded northern grown seed of the same varieties by 2 per cent

as an average of five years. The benefit comes from securing cool, moist conditions under the mulch.

Some field experiments. (Me. 236.) In a one-year test, which will be repeated, nitrate of soda was found superior to sulphate of ammonia as a potato fertilizer, the difference being about 6 per cent. Contrary to an unintended experiment in 1913, sulphate of iron was found harmful to potatoes when sprayed on the tops in 1914; so it is regarded as unsafe to use this material to kill mustard in potato fields.

On moderately heavy loam, underlain with an almost impenetrable subsoil, dynamiting proved of no benefit as a soil preparation either for oats or for apple trees.

Fertility and weeds. (N. Dak. 112.) Samples of many weeds were collected and analyzed, and the data arranged in most interesting tables to show the draft of these weeds on soil fertility, and their effect on the yields of the crops infested. A ton of lambs' quarters would remove from the soil nearly $19\frac{1}{3}$ pounds of nitrogen, but a ton of marsh elder (kinghead) would take only 3 pounds, while giant ragweed, ragweed, wild oats, rough pigweed, barnyard grass, purslane and pigeon grass come between in two groups, the first four removing more than 10 pounds of nitrogen per ton, the others distinctly less than that amount. Of phosphoric acid the giant ragweed removes most, $5\frac{1}{4}$ pounds per ton, and marsh elder least.

The author figures that a ton of either lambs' quarters or giant ragweed would remove enough fertility to grow 5 bushels of wheat, a ton of rough pigweed or barnyard grass enough for 4 bushels, a ton of pigeon grass for 3 bushels and a ton of marsh elder enough for 2 bushels of wheat.

ANIMAL INDUSTRY

Maintenance requirement of cattle. (Mo. Research, 18.) The data and conclusions given in this bulletin rest on work continued for seven years, probably the most comprehensive studies ever made of the development, growth, feeding, metabolism and composition of the tissues of cattle.

Some practical conclusions are that maintenance of cattle requires, per 1,000 pounds, slightly less than 9/10 pound of digestible protein and 13 therms of metabolizable energy. Condition alone seems to have no effect on the cost of maintenance, but previous full feeding will increase proportionately the subsequent cost of maintenance. The cost of maintenance decreases with age, and is least in spring and greatest in the winter, increasing with greater activity, and relatively faster with increasing weight.

Value of barley for cows fed alfalfa. (Cal. 256.) In certain parts of California, cattle are given either green alfalfa or alfalfa hay as roughage, either without or with grain, of which barley is the one most commonly fed. In a test with fourteen cows of the Station herd, divided in equal lots and fed for three three-week periods — alternating alfalfa alone and alfalfa and barley — the addition of the grain increased both body weight of the animals and amount of milk produced, but not to a profitable extent when immediate results only are considered. The authors believe, however, that because of the favorable effect of the grain on the condition of the animals and their offspring, its use is good practice and economically sound. This is especially true for heifers and young cows, and for heavy-producing animals which cannot be brought to their maximum yield on roughage alone.

Corn silage and alfalfa hay for beef production. (Nebr. 151.) In these tests with 48 steers, corn and alfalfa hay produced the cheapest gains, so that even at \$20 a ton the average profit on the three lots fed alfalfa would have been 15 per cent greater than that on the best lot not fed alfalfa. Cold-pressed cottonseed cake added to a ration of corn, alfalfa and silage increased the cost of gain and diminished the profits. Contrary to previous experiments heavy feeding of silage was not detrimental, and the use of silage in any amount had only beneficial effects upon the condition of the animals, and was followed by only slight shrinkage. Prairie hay was an inefficient and expensive substitute for alfalfa hay.

Winter steer feeding. (Ind. 178.) The addition of corn silage to rations of shelled corn, cottonseed meal and either clover or alfalfa hay decreased both grain and hay consumption, the saving of grain being greater with the clover hay ration and of hay

greater with the alfalfa hay ration, the two so balancing each other that the final increased profit from the use of silage was the same in each case, about \$7.60 per head.

The substitution of oat straw for legume hay gave larger profits when silage was fed with corn meal and cottonseed meal. Cottonseed meal, at the rate of $2\frac{1}{2}$ pounds per thousand live weight, gave more rapid and cheaper gains, equally good finish and decidedly more profit than 4 pounds per thousand.

Soy beans were eaten with relish for only three months, while cottonseed meal was avidly eaten after six months' feeding; the gains on the beans were less than on the meal, the finish poorer and the profits less. Gains were made more economically, from standpoint either of feed consumed or of financial cost, when clover rather than alfalfa hay was used in the ration, either with or without silage.

Silage and grain for steers. (S. Dak. 160.) Twenty steers in five lots were under test for 192 days, silage being used extensively during the first half of the time, preliminary to the regular fattening period.

Corn silage produced more than twice as much gain as sorghum silage when fed as the sole ration, a plain indication that where maize will mature there is no advantage in growing sorghum for silage. Three pounds of oil meal added to the silage rations, either of corn or sorghum, more than double the gains on silage alone, with reduction of the pound cost of the gains. Large gains on silage in the preliminary period were maintained in the fattening period. The use of legume hays with silage gave increased gains, but at an increased cost, and the silage fed lots were in better condition than those fed silage and hay, probably because of the additional corn in the full silage ration. Alfalfa hay was best of the legumes for feeding, but the steers on sweet clover hay made nearly as good gains during the preliminary period. The sweet clover, when made into hay before the stems became too woody, and cut before feeding, proved to be nearly as palatable and as valuable as the alfalfa hay.

Sheep feeding. (Ind. 179.) In fattening western lambs the addition of corn silage to a ration of shelled corn and clover hay reduced the cost of gain, slightly increased the selling value of

the lambs, and increased the profit; but the use of silage alone as roughage, or silage and oat straw, required great care to prevent the lambs from going "off feed," and resulted in slower gains and smaller profits. The addition of cottonseed meal to the corn, clover hay and silage ration, at the rate of one pound meal to seven pounds corn, improved the appetites of the lambs, increased the rate of gain, decreased the amount of feed for gain and increased the profit. The ratio of one to four for cottonseed meal and corn gave less advantageous results. Lambs fed in the open shed did better than those fed in the barn.

Alfalfa hay for hogs. (N. Mex. 96.) Previous tests at the Station had shown green alfalfa an admirable maintenance food for mature swine, such as breeding stock; and the present tests show that alfalfa hay has much value in fattening hogs. In three of the four tests, where the animals were not too near maturity for good results, 7 pounds of alfalfa hay were found equivalent to 6 pounds of the concentrates used. Of these concentrates fed with alfalfa hay, ground corn alone gave better results than skim milk with shorts of bran, or ground corn with skim milk. If skim milk is used with alfalfa hay it must be supplemented with a strongly carbohydrate feed like corn, barley or milo.

Comparing breeds used in these tests, Tamworths made much more rapid gains than Duroc-Jerseys, but required slightly more feed for a pound of gain. Both breeds are prolific, averaging about 9 pigs to the litter in 36 litters, with the advantage in numbers slightly in favor of the Duroc-Jerseys.

Distillers' grains and wheat for swine. (Ky. 190.) Pigs on pasture made better gains with a supplementary ration of corn meal than with one of dried distillers' grains, though the cost of the gain was practically the same. Swine evidently do not relish the grains when fed alone. The best results, both in rapidity of gain, amount of gain for food fed, and cost of gain, came from hogs on pasture with a supplementary ration of corn meal and dried distillers' grains, 5 to 1; while this combination fed in the dry lot was the most expensive source of gain.

The distillers' grains, however, fed alone to swine on pasture, made the pasture profitable; since without the grains the pigs barely maintained their weight.

In dry-lot feeding, ground wheat, dry, produced more rapid and more economical gains than ground wheat, wet, or whole wheat, soaked; but did not quite equal ground wheat and digester tankage, 14 to 1, in rapidity of gain or amount of gain for food fed, while the cost was practically the same. Returns would evidently have been much better had the pigs been on pasture, since the gains, etc., were better than with the lot fed corn meal and distillers' grains in the dry lot in the preceding experiment.

Composition and value of certain feed materials. (Mass. 158.) Molassine meal appeared to be of value only because of the molasses it contains, the moss basis being largely indigestible. The meal, as a whole, is noticeably inferior to corn or other cereals. Cows on a corn-meal ration produced 16 per cent more solids and fat than on a molassine meal ration.

The quality of the cotton seed products on the Massachusetts market shows a constant deterioration, averaging 6 per cent less in protein in 1914 than ten years before, while some low-grade goods contained nearly one-third less digestible matter than those of high-grade, due to admixture of hulls. Such adulteration not only decreases the amount of protein in the feed, but lowers its digestibility, making the material of even less value than analysis would indicate.

Cocoa shells were found to have a feeding value about one-half that of corn meal.

Grain screenings, if reasonably free from dirt, chaff, straw and an excess of noxious seeds, and if finely ground, have a feeding value approximating wheat bran.

Flax shives must be considered an adulterant of feeds, as they contain only a small amount of digestible matter and little protein, while the large amount of fiber requires much energy for its passage through the animal.

Mellen's Food Refuse has feeding value only three-fourths that of wheat bran.

C. X. X. Feed, presumably a refuse from the preparation of Instant Postum, is of very inferior feeding value.

DAIRYING

Experiments with Sharples milker. (Ky. 186.) This is a preliminary report upon this machine after one year's work with

it, from which definite conclusions are not drawn. The general results appear to be favorable to the machine when properly used, but cost is given as a decided objection.

Pasteurization of milk in final package. (Iowa, 154.) Extended and comprehensive pasteurization tests are here reported, the data being presented in 72 tables and fully discussed.

In general, the results favor 50 minutes' exposure in a vat heated to 145 degrees, as good bacterial efficiency is thus secured, with much delayed, clean, lactic-acid souring of the milk, little decrease in creaming ability of the milk and very slight development of the heated flavor. Open or closed bottle exposure appeared to make no difference in creaming ability or heated flavor.

Pasteurization of cream for butter making. (Iowa, 156.) The extensive studies recorded in this bulletin show that pasteurization of either sweet or sour cream improves the flavor of the resulting butter, with only a slight additional loss of fat in the buttermilk from the pasteurization of sweet cream, and no additional loss or even a gain in the case of sour cream. The flash method for sour cream rations more of the fat than the holding method, and the latter method slightly injures the body of butter made from sweet cream pasteurized by it. The flash method of pasteurizing sweet cream lowers the moisture content of the butter, while the holding process of pasteurizing sour cream increases the moisture content of the butter. Pasteurization of the cream did not improve the keeping quality of the butter made from it.

Making whey butter at cheese factories. (Wis. 246.) This bulletin describes in detail the sources of income, expense and profit, and various practical methods of conducting the business of making whey butter.

Disposal of creamery sewage. (Wis. 245.) This bulletin emphasizes the necessity of a filter bed as well as a septic tank for disposing of creamery sewage; and gives full directions for computing the size of outfit required under different conditions and for constructing a system.

POULTRY KEEPING

Milk for chickens. (Storrs [Conn.] 80.) The feeding of milk to young chicks has a most favorable influence on the growth, and

in lessening mortality. If fed soon enough and long enough, it greatly reduces the death rate from bacillary white diarrhea. Sweet and sour milk are apparently of equal value, as the good effect is evidently not dependent on the acids present nor upon particular types of organisms, but upon one or more of the material constituents of the milk. The free feeding of milk, especially to early hatched chicks brooded indoors, requires special attention to securing exercise for the birds.

No difference in feeding value is shown between sweet or clean sour milk, but chicks should not be changed from one form to the other.

Rations for capons and roasters. (Ohio, 184.) The lot of capons which received a ration carrying throughout the fattening period a fixed proportion of protein, made a better rate of gain at a lower feed consumption per pound of gain than the lot receiving a ration with diminishing protein, a so-called fattening or carbohydrate ration. The cost of feed was about the same for both lots, however, taking the average of two experiments. The lot on corn, wheat and oats (11, 15, 4), with a mash of ground corn, bran and beef scrap (2, 2, 1), ate more feed per pound of gain and cost more than the two preceding lots on corn, with a mash of corn and beef scrap (2, 1 or 1, 2, for first week changing gradually to 16 to 1 for 32d week); but the lot on corn and oil meal made an even poorer growth. Capons confined ate only 2 per cent less feed but made 17 per cent less gain than those allowed free range.

Egg-laying contest. (Storrs [Conn.] 82.) Notes are given on the development of egg-laying contests with a somewhat detailed account of the "Third Annual International Contest" as conducted at the Station. Houses, nests and methods of feeding are described, with monthly egg records of the 82 pens, and summaries of feed consumed and cost of production. The return above cost of feed ranged from \$23¾ to \$15 with the different breeds, the Leghorns leading, followed closely by Wyandottes, and with quite an interval, by the Reds and Rocks. One hen produced eggs worth \$42½ more than the cost of the feed, while another gave a return of only \$5 more than the feed cost.

Poultry-house construction. (Storrs [Conn.] 81.) This bulletin discusses the general principles of poultry-house construction, with special reference to securing ample supplies of light and air without draughts; and gives plans and specifications for several types of houses found useful at the Station. Directions are also given for making the Connecticut trap nest, apparently a very simple and effective type, and of the Connecticut dry-mash hopper.

VETERINARY SCIENCE

Intradermal testing for bovine tuberculosis. (Mont. 105.) By this method only small quantities of tuberculin are required, the injection is very simple, and no thermal record is required, as the index to the presence of tuberculosis is a distinct swelling about the point of injection, usually in the smooth skin underneath the tail near its base. Some experience is necessary in interpreting results, but this is easily acquired, and the indications from the test are fully as reliable as from the ordinary injection test. The reaction reaches its maximum from the twenty-fourth to thirtieth hour, but the swelling remains for at least 70 hours, thus making the test very convenient for inspectors. At least three times as many animals can be tested by it as by the usual method. It produces no interruption of milk flow and interferes in no way with herd routine.

Hog-cholera "cures" and specifics. (Iowa Circ. 25.) Seven so-called hog-cholera cures or specifics were tested on 34 hogs, all of which died after exposure to infection, as did six untreated animals. Of six hogs treated with the Niles-Dorsett serum (approved by the U. S. Government and many Stations), not one died. Warn all swine owners to beware of any proprietary hog-cholera remedy!

FRUIT GROWING

Fertilization of peach orchards. (W. Va. 150.) Four years' work with fertilizers in peach orchards led to the following results: On shale loam soil low in fertility, with Carman and Waddell peaches, the yearly growth of trees treated with nitrate of soda has been double that on no-nitrogen plats, the bearing surface at the end of the second year being $2\frac{1}{2}$ times that on trees not given

nitrogen, and at the end of the fourth year the difference was much greater, while the leaf surface was 4 times as great.

The set of fruit buds was in the ratio of 76 to 60 for nitrogen-treated and untreated trees, and the quantity of fruit on the former was nearly double that on the trees not receiving nitrogen. The nitrogen delayed maturity and weakened color, through the exclusion of sunlight by the heavy foliage.

Lime and potash were without favorable effect, the latter possibly deleterious.

Pruning. (Oreg. 130.) This bulletin of 72 pages, illustrated with 59 figures, is a very comprehensive study of the principles and practices of pruning. It includes a study of plant physiology as related to pruning, a study of fruit buds and their development, and articles on pruning young trees, apple and pear trees, and prune trees, by four authors. While the pruning practices are handled from the western standpoint, of course, the principles are so thoroughly discussed, and the results from the operations so plainly shown by excellent illustrations, that the book is well worth study by any horticulturist or fruit grower.

Profits from spraying twenty-five Missouri orchards in 1914. (Mo. 124.) This 100-page bulletin is a splendidly stocked arsenal of arguments for spraying, for the use of institute men and county agents. Several orchards showed gains of from \$300 to \$400 per acre from spraying. Full details of methods and cost are given for the separate orchards, and the costs are well summarized for all, by application.

INSECTS AND DISEASES

Observations and experiments on San Jose scale. (Ill. 180.) It has been the belief that there is little or no danger of the spread of San José scale by ripe apples, as it was held that the scales die as the apples ripen. Experiments here recorded show, however, that females live and reproduce freely on such apples plucked from the tree and kept at the ordinary room temperatures, for a period of at least eight weeks. Infested apples taken from cold storage in December gave similar results, young scales appearing for twenty-five days.

Exact breeding experiments, made in 1906, showed that from the last-born descendants of successive females only two complete

generations were reproduced, but from the first-born descendants four generations resulted. Computations based on these data show a possible rate of multiplication in a year of approximately 35,000,000 to one for the year, under optimum conditions — a ratio of increase only about 1/100 as great as that of some other investigators who failed to consider the smaller number of generations from late-born scales in a series.

Spraying experiments with various preparations of lime and sulphur, and with two miscible oils, justify the usual preference for the sulphur compounds, owing to their prolonged effect in spring spraying. Home-made preparations were as effective as commercial. Early spraying, before the orchard is seriously infested, is of marked advantage, and spring treatment superior to fall spraying. That badly infested orchards may be redeemed and maintained in good condition with one or two sprayings a year was proven by the tests.

Potato insects (Iowa 155).— This is a comprehensive discussion in 64 pages, well illustrated, of the insects affecting the potato plant. In several cases charts are given showing the relation of the life cycle of the insect to the growth of the plant, thus making clearer the proper time for treatment.

Diseases of the sweet pea (Del. 106). This is a very comprehensive discussion of nearly a dozen sweet pea affections, rather scantily illustrated. Boiling seeds for one to two seconds, soaking in sulphuric acid, or soaking in formalin, aid in controlling some of the diseases, but watering the soils with chemical poisons does not increase the resistance of plants grown on that soil.

RURAL ECONOMICS

Cost of producing Minnesota field crops (Minn. 145). This bulletin is of interest in New York mainly through its presentation of methods and discussion of the cost factors involved in crop production, with the effect upon these of changes in conditions.

Cost of production on Missouri farms (Mo. 125). Another excellent presentation of the methods and factors of cost accounting.

Cooperation among farmers in Minnesota (Minn. 146). Minnesota leads the states of the Union in the number of cooperative

organizations among farmers, and this bulletin gives a little idea of the scope and extent of these organizations. They include 2,013 associations, creameries and telephone companies leading with 600 or more of each, with elevators, fire insurance companies, stores, stock shipping associations, cattle- and horse-breeding associations, cheese factories, potato warehouses and cow-testing associations following, with from 270 to 11 members, and several other organizations with fewer units. It is estimated that these associations do more than a \$60,000,000 business.

MISCELLANEOUS

Comparative cooking qualities of apples (Oreg. 124). This most interesting series of studies is one of the first of its kind to be made scientifically, and brings out some striking variations in the adaptability of various apples for special purposes. About seventy varieties were included in the tests, of which comparatively few were found especially good for sauce; more were good for jelly and many more for pies. Contrary to common opinion good dessert quality and good sauce making quality were not closely correlated, though the relationship was much closer than between dessert quality and adaptability for jelly making. Among the best apples for sauce were Rambo, Tompkins King, Grimes, Ortley, Wagener, Northern Spy and Yellow Bellflower; among those best for pies Northern Spy, Bottle Greening, Mountain Sweet, Rambo, Bethlehemite, Beitigheimer, Maiden Blush, Ribston Pippin and McMahon; those scoring highest for jelly making, Scott, Lawver, Twenty Ounce, Maiden Blush and Melon; and for dumplings Fameuse, Maiden Blush, Minkler, Grimes, Northern Spy, Red Canada, Tompkins King and Scott. Physiological studies, which are illustrated, were made in connection with the cooking tests.

Proso and kaoliang as table foods (S. Dak. 158). This large-seeded millet and grain sorghum are excellent drought-resisting crops, and have a place in the north where maize often fails. Both have shown value as stock foods; and this bulletin proves that they may also be added, with advantage, to the list of human foods used in America. Many recipes are given for preparation of both.

TREATED ROCK vs. RAW ROCK AND BASIC SLAG

PROFESSOR G. W. CAVANAUGH

The choice of commercial phosphoric acid seems to be limited to acid-phosphate and ground rock phosphate. It depends largely under what conditions they are to be used, which one should be chosen. In general, where organic matter is low in the soil, or can be supplied only in limited amounts by cover crops and manures, it seems advisable to use the acid-phosphate. Where the organic matter in the soil is high, or for use in composted stable manure, the cheaper rock phosphate may be recommended.

Acid-phosphate may be indirectly beneficial, through the action of its gypsum, in making the soil's potash available.

Acid-phosphate may be useful on acid soils.

ADVICE AS TO POTASH

PROFESSOR G. W. CAVANAUGH

The potash situation is simple though unsatisfactory. The only sources seem to be (a) the potash in the soil, (b) in wood ashes and (c) small amounts in the hands of some dealers. While there are some efforts being made to obtain potash in this country, these have not yet materialized in a commercial way. For the present the principal source seems to be the native supply in the soil. This quantity varies with localities and types of soil.

Eight samples of soil were recently obtained from Jefferson county through the cooperation of the county agent. The samples were analyzed for potash. Following are the results:

Sample 1.....	2.46 per cent K_2O
Sample 2.....	2.62 per cent K_2O
Sample 3.....	1.78 per cent K_2O
Sample 4.....	2.32 per cent K_2O
Sample 5.....	3.16 per cent K_2O
Sample 6.....	2.87 per cent K_2O
Sample 7.....	1.91 per cent K_2O
Sample 8.....	1.81 per cent K_2O

On the basis of 2,000,000 pounds of soil per acre (8 inches deep) these soils contain from 35,600 pounds K_2O in sample 3 to 63,200 pounds K_2O in sample 5. To render a portion of this potash available the following means may be considered:

- (a) The action of decaying organic matter.
- (b) The action of lime.
- (c) The action of other fertilizers.

NEW FORMS OF SOLUBLE NITROGEN

DR. L. L. VAN SLYKE

Strictly speaking, there are no "new forms of soluble nitrogen," using new in its literal sense. However, extending its meaning to a period of ten years or so, there are three forms to which attention can be called: (1) calcium cyanamid, (2) calcium nitrate, and (3) nitrogen compounds prepared in the so-called wet way.

CALCIUM CYANAMID

1. *Composition.* Calcium cyanamid is a compound containing the elements calcium, carbon and nitrogen. When chemically pure, it contains 35 per cent of nitrogen, but the commercial product, which is commonly known as lime nitrogen, is not pure. The product at present on the American market contains from 15 to 16 per cent of nitrogen. It is a fine powder of dark-gray color.

2. *Method of Manufacture.* The two principal materials used in the preparation of calcium cyanamid are: first, pure nitrogen obtained by liquefaction of air and distillation; second, calcium carbide, the substance that is so familiar in the production of acetylene gas. The carbide in the condition of a fine powder is placed in a heated retort, into which the nitrogen is passed. Combination takes place with the resulting formation of impure calcium cyanamid, which is removed from the retort in the form of a hard cake. This is cooled out of contact with the air and then crushed to a powder before packing. The impurities consist in large part of calcium oxide (quicklime) and compounds of iron, silicon, etc., in addition to the carbon formed in the operation, the presence of which is the cause of the dark color of commercial calcium cyanamid.

There is one large factory in America in successful operation, located at Niagara Falls, which made its first shipment in December, 1909. The product is all shipped to Baltimore, where it is further manipulated before distribution to the trade. The product commonly put out contains 15 to 16 per cent of nitrogen, of which 80 per cent is cyanamid nitrogen and 20 per cent is ammonia nitrogen, or a mixture of ammonia and nitrate nitrogen.

Cyanamid is used very extensively in commercial fertilizers, some three hundred fertilizer factories employing it more or less in their mixtures.

3. *Cost.* The estimated first cost of producing cyanamid nitrogen is said to be about 10 cents a pound, but, by the time it reaches the farmer, its cost is probably about the same as that of nitrate and ammonia nitrogen.

4. *Availability.* Calcium cyanamid has about the same availability as that of ammonia nitrogen, when compared for the period of a growing season. This would be expected from the fact that when cyanamid is applied to soils, its nitrogen changes into ammonia. Calcium cyanamid itself is not used as food by plants, but first undergoes change into ammonia and then changes more or less to nitrate.

5. *Effects of use of cyanamid.* The main product of decomposition of calcium cyanamid left in the soil is calcium carbonate. Under some conditions, calcium cyanamid forms in the soil a compound called dicyanamid, which has a poisonous effect upon plants. It has been claimed that calcium cyanamid as now put on the market is not liable to undergo this injurious form of change.

6. *Advantages.* The following claims are made by the manufacturers for calcium cyanamid: It is quick and progressive in action, has a soil duration of nearly three months, is not washed away by rains, neutralizes free acids, prevents the rotting of bags, is odorless, does not lose nitrogen, can be stored indefinitely without trouble, and is of advantage in damp mixtures.

CALCIUM NITRATE

1. *Composition.* Calcium nitrate, commonly known commercially as lime nitrate, is another compound, the nitrogen of which is furnished by means of atmospheric nitrogen. This is comparatively new. Its agricultural use has been largely confined to Europe, only small quantities coming to America before the war, and none since. This material is a mixture of calcium nitrate and other substances, chiefly lime. Pure calcium nitrate contains 17 per cent of nitrogen, but the commercial lime nitrate contains only 12 to 14 per cent.

2. *Method of Manufacture.* There are at least three different processes of making lime nitrate, but all are based on the same general principle, differing only in some of the mechanical details. Briefly stated, the general process consists of the following operations: (1) Ordinary air is passed through a powerful electric arc or flame, resulting in the combination of more or less of the oxygen and nitrogen in the form of nitric oxide. (2) This nitric oxide, on exposure to air, combines with more oxygen to form nitrogen dioxide. (3) By treatment with water this last oxide is converted into dilute nitric acid. (4) The last step is to concentrate the nitric acid and treat it with calcium oxide and carbonate, forming calcium nitrate.

There have been reports of the organization of factories in this country, one in South Carolina and one in California, but little definite information is yet available.

3. *Cost.* Nitrogen in lime nitrate is estimated to cost about 15 cents a pound at the factory.

4. *Availability.* Calcium nitrate is easily soluble in water and its nitrogen is taken directly into plants.

5. *Effects of use of calcium nitrate.* Calcium nitrate leaves in the soil, after the nitrate has been absorbed by plant-roots, calcium, which becomes carbonate under normal conditions, and on this account is a more desirable compound to use than sodium nitrate, which leaves sodium carbonate — a compound which in sufficient quantities may destroy the granular structure of the soil.

It is of interest at this time to know that the development of this method of making nitric acid has made it possible for Germany and Austria to be wholly independent of all outside supplies of nitric acid, which is an absolute essential in the manufacture of all high explosives as well as gunpowder.

NITROGEN COMPOUNDS PREPARED IN THE WET WAY

Within a few years fertilizer manufacturers have found a method of making legitimate use of various waste materials, rich in nitrogen, which in their original form contain practically no available plant-food. Chief among such wastes and refuse are hair, garbage, tankage, leather, scraps, etc.

The method of converting unavailable organic nitrogen into available forms is very simple in theory and is not complicated in practice. The organic material is mixed with sulphuric acid and rock phosphate in the process of dissolving rock phosphate and making acid phosphate. A considerable degree of heat is developed in the process; and, under the combined action of acid and heat, the nitrogen compounds of the organic material are profoundly changed, forming new nitrogen compounds, wholly different in character from the original. Organic nitrogen compounds produced in this way have an availability equal to or greater than that of dried blood. In the trade, fertilizers prepared in this way are usually called "processed fertilizers" or "base goods," the word base being used in a chemical and not commercial sense.

UNDESIRABLE FORMS OF EXPLOITED SO-CALLED PLANT FOOD

DR. L. L. VAN SLYKE

Not even the patent medicine business furnishes a more flourishing soil for fakes than does the sale of fertilizers. And one amazing feature is that, even after all the extension work that has been done to put farmers on their guard, and in spite of the ease with which farmers can get reliable information at the cost of a postal card, the woods are still full of "suckers." The past year has furnished unusual opportunities for farmers to get "stung," owing to the scarcity of potash compounds.

Attention will be called to three classes of fertilizers which are utilized by fakers: (1) Mineral plant-foods, (2) humus materials and (3) specials.

MINERAL PLANT-FOOD FAKES

From time to time during the past twenty-five years, there have been promoted various materials as fertilizers which consisted largely or wholly of some form of ground rock, such as granite, feldspar, lava, etc. In this class attention is called to the following: (1) Stonemeal, (2) mineral fertilizer, (3) new mineral fertilizer.

Characteristic of the literature advertising these materials is an extravagant claim for wonderful results; and, in addition, many of the most important fundamental facts relating to plant nutrition are baldly denied and agricultural scientists are given a generally bad reputation for ignorance and unreliability.

(1) *Stonemeal*. The worst fake during the past year has been the stonemeal fertilizer, sold by the Stonemeal Fertilizer Co., North Paterson, N. J. The prices paid vary from \$26 to \$37 a ton. A few quotations from their literature will reveal their methods. Much is made of the unsupported statement that normal soils produce clean crops, because such soils contain only minerals, while the use of animal matter produces filthy crops, unhealthful for human food.

The advertising pamphlets issued by the Stonemeal Co. are models of misstatement of facts, hypocritical claims, malicious

abuse of agricultural scientists and complete innocence of any reliable knowledge of the fundamental principles of plant nutrition. Here are a few selected gems quoted from the Stonemeal patent medicine literature: "Some of our so-called scientific soil doctors will tell you that Stonemeal is almost entirely insoluble in distilled water in the laboratory; but, in the first place, their sayings have always proved most unreliable." "Stonemeal, being nothing but mechanically prepared virgin soil, contains *all* the mineral elements as the all-wise Creator provided them in nature and * * * it is therefore the only natural, logical and, in itself, complete nourishment for plants in existence." "Anyone who grows and sells for use an article of food from anything but normal soil is more guilty of wrong-doing than the adulterator of food, because he sells spurious goods under false pretense." "Everyone, of course, ought to admit the spontaneous generation of insects as an undeniable fact." "Stonemeal, being made from primitive rocks and containing all the elements first named above, is the only natural, logical and perfect remedy. With it you will positively be able to restore your soil, within a certain time, to its original virgin fertility. * * * You will obtain better yield and healthier plants than heretofore and you will entirely eliminate the danger and risk of having your plants destroyed or injured by insects." "The indisputable fact is that the germs are in all cases, without exception, spontaneously generated out of the albuminous matter of decomposition. * * * Were the albumen normal, which means that, were all the mineral elements therein represented, it would not be subject to decomposition, and, of course, the generation of insects would be impossible." "With the exception of virgin soil itself there is nothing in the market which will furnish these mineral elements except Stonemeal."

These are enough specimens. It would be too nauseating to continue. It would be difficult to find a greater jumble of meaningless jargon, absolute ignorance of facts and persistent attempts to mislead the ordinary farmer.

We have recently analyzed numerous samples of Stonemeal at the Geneva Station. Guaranteed to contain over 10 per cent of phosphoric acid and also of potash besides a dozen other things,

we find the samples examined contain less than 5 per cent of phosphoric acid and that insoluble, while only a trace of soluble potash is present. Stonemeal may properly be regarded as one of the most stupendous swindles of its kind.

2. *Mineral fertilizer* is the name of a product invented and sold by John A. Wendel, M. D., Milwaukee, Wis. The Milwaukee doctor has also invented the following statements: "Permit me to call your attention to my Mineral Fertilizer and its remarkable properties. Users of it will without fail reap a bounteous harvest, and the quality of the products will be superior in every way. Nor, is this all; the yield will be augmented three-fold to five-fold, results which cannot be obtained by the use of chemicals or artificial fertilizers such as Chili Saltpeter, Guano, Thomas Slag, Nitrogen, etc. On the other hand, it has been shown that the use of these substances as fertilizers has caused diseases to appear which were unknown prior to their use, and masses of worms and insects were propagated, to the detriment of all vegetable life." "Artificial fertilizers are a failure." "The nitrogen theory is founded on error." "Growing crops draw this [nitrogen] to themselves from the air." "If its use [Mineral Fertilizer] becomes general, it will insure healthy cattle and pure, nutritious milk, which will not need to be sterilized." "The price of the fertilizer is \$20 a ton. * * * Cash must accompany all orders. * * * All orders will be filled with promptness and dispatch. Send in your orders early so as to get quick results."

3. *New Mineral Fertilizer*. This was carefully studied by the Maine Experiment Station for two years in field experiments with corn and potatoes. The results showed this fertilizer to be wholly without value as plant-food.

HUMUS MATERIALS

Several materials are on the market which are being promoted on the strength of their humus content. These are mainly made from dried, ground muck or peat, and may contain some added plant-foods. One of the most extensively advertised of this class of materials is called "Alphano." Its pamphlet abounds with misleading and false statements—thus: "Alphano humus has nearly eighteen times the value of manure in nitrogen."

"Alphano has the remarkable property of taking nitrogen from the atmosphere and absorbing it ready for the plant to take up."
 "It is a natural carrier of atmospheric nitrogen to the plant."
 "The air is four-fifths nitrogen, but no process has yet been devised to take advantage in a commercial way of this vast store of wealth." The price usually charged is \$20 a ton.

SPECIALS

In this connection, attention is called to a new fertilizer recently appearing called "Radium Fertilizer (plant-food)." This contains nitrogen, phosphoric acid and potash, and in addition radium. It is put out by the Radium Fertilizer Co., Pittsburgh, Pa. It sells at \$300 a ton and up, according to the amount purchased. It requires over 800 pounds of fertilizer for one acre. Experiments recently made in Illinois show that radium has no appreciable effect on plant growth. Prof. Ramsey, of the Department of Physics, Indiana University, states that the average soil already contains ten times as much radium as would be found in this radium fertilizer. To double the radium emanation in the soil would require about 75 milligrams of radium at a cost of \$7,500 an acre.

ADVICE FOR FARMERS

In speaking to farmers at institutes about fertilizers, warn them to be on their guard against new fertilizers or any fertilizers that make remarkable and exclusive claims for results. When a farmer is approached by an agent of one of these things, let him write to one of the experiment stations before investing any money.

PREFACE TO PROF. McINTYRE'S ARTICLE

Through a misunderstanding, Professor McIntyre prepared a paper which follows, on "The Use of Lime," but did not present a concise statement as to the relative value of fineness in carbonate of lime, as outlined by the program.

After consultation with Dr. L. L. Van Slyke, of Geneva, and Professors E. O. Fippin and George W. Cavanaugh, of Cornell, the statements on this subject given at the last year's Normal were reiterated, and is as follows:

LIME

PROFESSOR E. O. FIPPIN

STATUS OF KNOWLEDGE

Our knowledge concerning the nature of soil acidity and the effects of lime, together with the relative efficiency of different forms of lime in the soil and their effects on the various factors that determine fertility of the soil, is still very incomplete. Similarly, our knowledge as to the exact relation of different varieties of crops and field plants to soil acidity and lime is very incomplete. Information of this sort is accumulated very slowly and it is important that we retain an open mind for new data.

NATURE OF SOIL ACIDITY

Definitions of soil acidity are difficult to frame and are largely unsatisfactory. Two classes of material in the soil may give rise to acidity. These are the inorganic or mineral acids and the organic acids resulting from the decay of organic matter. The earlier notion that organic acids are relatively few in number and simple in composition and relationship is now thoroughly displaced. A large number of organic acids in the pieces of plants, and also resulting from the decay of organic matter in the soil, are now known. They vary with the soil and the plant. That definite free acids occur in the pieces of plants used as green manure is shown by a recent study of covill, of the U. S. Department of Agriculture:

Crop	Yield per acre	Lime content	Free acidity expressed as lime requirement
Alfalfa	2½ tons	193 lbs.	267 lbs.
Red clover	2 tons	131 lbs.	142 lbs.
Cow pea	2½ tons	92 lbs.	200 lbs.
Rye	2 tons	11 lbs.	178 lbs.
Broom sedge	1 ton	4 lbs.	89 lbs.

Acid constituents in the soil may be in both the soluble and insoluble condition; the former would appear freely in the soil water. Such a condition is very unusual, as the soil solution is usually neutral or alkaline. Nearly all soils have a large excess of silicic acid, which is very insoluble either in silicate compounds or in the form of quartz grains.

Soluble acid materials produce a positive acid condition. The insoluble forms are termed negative acidity and may be called lack of basicity. In either case lime and other basic elements will be actively taken up.

FORMS OF LIME

Results on the Cornell University Farm and on plots at Virgil, both of which have continued for only two or three years, and from which no decisive conclusions can be drawn, have shown somewhat better results from caustic than from carbonate lime.

Magnesium lime has given results inferior to calcium lime.

DISAPPEARANCE OF CAUSTIC LIME AND OF CALCIUM AND MAGNESIUM LIME CARBONATE IN THE SOIL

Bulletin 107 of the Tennessee Station, recently published, gives the most definite data available on many of these points. Tests in carbonated water and in carbonated wet soil showed that both calcium and magnesium oxide were completely carbonated in four hours. The indication, therefore, is that caustic lime does not remain in the normal soil as such for more than a few hours or days at the most, and any difference in the effect of caustic and carbonate lime on the soil after that date must be due to some other factor than persistent causticity.

Magnesium carbonate is found to rapidly disappear from the soil due to the union of the magnesium oxide with silica to form the silicate of magnesium, which is only one-third to one-fourth as soluble as dolomite. This change occurs to a large extent in a few weeks. As much as fourteen tons were found to disappear in an acre seven inches of very acid soil. Calcium carbonate is very much less affected in the same manner. Injury from the use of magnesium lime is probably due to the silicate compounds and not to its persistence either as caustic magnesia or as magnesium carbonate, which latter is only half as soluble as calcium carbonate.

The magnesia in silicate form has some value to keep the soil sweet and promote the growth of lime-loving plants.

New York soils pretty generally contain more magnesium than calcium in total. Strongly magnesian lime is, therefore, not desirable on the soil. However, the use of a lime containing not over 15 per cent of magnesia is not seriously objectionable.

FINENESS OF LIMESTONE

Bearing on the relation of fineness to solubility, the Tennessee investigations show that ground limestone passing a one-hundred-mesh screen, and in which the average length of crystals was .005 millimeter (.0002 inch), was only 7.7 per cent as soluble in carbonated water in four hours as precipitated chalk in which the average length of crystals was .0003 mm. (.000012 inch). This difference in solubility may be attributed to difference in surface exposed by the particles to solution.

No conclusion as to the proper fineness can be drawn from field tests where limestone containing particles of a wide range of fineness is used.

The possibilities of distributions may readily be calculated. Assuming that one ton of ground limestone is uniformly distributed in the surface six inches of soil of one acre, the number of particles in each cubic inch of soil for different degrees of fineness would be as follows:

Diameter of limestone particles	Particles per cubic inch of soil
1/10 inch=2. millimeters.....	2.
1/50 inch=0.5 millimeters.....	137.
1/100 inch=0.25 millimeters.....	1200.

Since the diffusion of soluble material through the soil is known to be exceedingly slow, the inference is that large particles of lime would form a thin shell of neutral or slightly alkaline soil, and the remainder of the mass would be influenced only as the capillary movement of water carried the lime carbonate beyond this shell. The probabilities of the tenth-inch materials reaching the entire cubic inch of soil within five years is small.

The following statement of influence of fineness upon availability was agreed to by Messrs. Van Slyke, Fippin, Cavanaugh and Collison:

First. Availability is approximately proportional to fineness.

Second. Ten-mesh stone has about 50 per cent that will pass a 50-mesh sieve.

Third. Use of ten-mesh size vs. fifty-mesh size depends on quantity to be used and on cost of both material and of handling, including freight.

Fourth. About twice as much ten-mesh sieve as of fifty-mesh is required to furnish amount necessary for five year period or average period of rotation.

RELATIVE EFFICIENCY OF CARBONATE OF LIME OF VARIOUS DEGREES OF FINENESS

W. H. MACINTIRE

INTRODUCTION

In the art of agriculture, the use of lime for soil improvement constitutes a practice which has been followed since ancient time. However, in spite of this long usage, relatively little advance has been made scientifically in the simplification of lime problems. Particularly is this true in regard to studies as to differential values between lime carbonate of various degrees of fineness. As an instance in point, the chemical composition of limestone and the chemistry of its burning were not known until about 1800.

In so far as we know, the custom of burning lime for building purposes antedated the practice of its agricultural use. It was, therefore, known that by burning, the hard limestones could be made utilizable as well as the soft chalks, marl and ashes, which were probably first used for agricultural purposes. Agriculturally speaking, then, the practice of burning was followed primarily to permit utilization of limestone, especially the harder rocks, by effecting a state of fineness which would permit of its application to the soil.

It is our purpose, in submitting this paper, to enter into a consideration of some of the chemical activities which are characteristic of the various forms of lime. It is not our intention to dwell upon the biological phase of the soil needs for lime, nor to any extent upon the comparative physical effects of liming, but rather upon the chemical activities of the carbonate forms in the soil.

At this point, let it also be understood that we have no intention of entering the field of economics of the use of lime in its various forms, under such conditions as exist in the state of New York. A study of Circular No. 7 of the Cornell Station will show that the cost problems are well understood and ably handled by the extension service of Cornell University. Furthermore, the problems with which we are familiar in our own state may be very different from those of your state. Over vast areas in Tennessee, we have underlying limerock. The crusher often goes to the farmer and his limestone comes from his own farm. Tran-

sient crushers are sometimes available after the manner of wheat threshers. But, in some cases of isolation and long, difficult haul, common sense dictates the use of the most concentrated form of lime; that is, burnt lime, in preference to limestone.

In more recent years the commercial basis of comparison between ground limestone and burnt lime has undergone considerable change, because of the marked development in moderate priced portable crushers, which give a large tonnage per diem of very finely ground limestone. Then, too, some extensive industries, such as the production of zinc, have made available, in some communities, large quantities of cheap, by-product limerock. However, even the finest pulverized limestone is not comparable in fineness with the carbonate of lime which is formed from burnt or hydrated lime in soils. But, be it emphasized, fineness governs solubility. An apt parallel may be drawn, for purposes of comparison, between availability of equal amounts of CaO as oxid or hydrate after carbonation, as compared with finely ground limestone, and the availability of equal amounts of phosphoric acid in the form of acid phosphate and finely ground phosphate rock. It is generally held that, under favorable soil conditions with reference to lime, the ultimate product to be found in the soil subsequent to application of acid phosphate is identical chemically with finely ground raw phosphate rock. However, as we know, there is a vast difference between the availability of these two physical forms of the same chemical product. In other words, degree of fineness determines the chemical activities, the rate of solution, and hence availability to the growing plant.

The following table will give some idea of the influence of fineness upon solubility. The data were secured from separates of the same sample of New York limestone and compared with carbonated burnt lime.

TABLE I.

SOLUBILITY OF CaCO_3 IN CARBONATED WATER AS INFLUENCED BY DEGREE OF FINENESS.

<i>Size of CaCO_3</i>	<i>Solubility coefficient</i>
Greater than 10 mesh	1.
10 mesh — 50 mesh	2.2
50 mesh — 100 mesh	6.2
100 mesh — 200 mesh	8.0
Less than 200 mesh	14.8
Carbonate from burnt lime	28.0

Definite amounts of the 50-100 mesh separate of Table I were agitated with definite amounts of acid volusia silt loam for 15 hours in the laboratory. The reaction between the limestone separate and soil as measured by the decomposition of CaCO_3 was compared to that found when using the separate finer than 200 mesh. The 50-100 mesh material decomposed at the rate of 3000 pounds of CaCO_3 per A. 2,000,000 pounds of soil, while the fined material decomposed at the rate of 6000 pounds per A. 2,000,000 of soil. It is evident from these data that, as would be expected, fineness has an extensive influence upon the degree of solubility.

However, we must at this point emphasize that no matter whether we use CaO , burnt lime; Ca(OH)_2 hydrated lime; CaCO_3 ; or ground limestone; the consideration of the carbonate must be the basis of comparison, for as we will show, the oxid and hydrate forms are quickly converted again to carbonates, either when they are left on the surface or when incorporated in the soil. Hence, a discussion of the characteristic properties of the three commercial alkaline forms of lime resolves itself into a consideration of the influence of degree of fineness upon the reactive and retentive properties of CaCO_3 .

TABLE II.

CARBONATION OF BURNT LIME AND HYDRATED LIME UPON AN ACID SOIL. LIME APPLIED IN EACH CASE EQUIVALENT TO 28,180 LBS. CaCO_3 PER ACRE, 2,000,000 POUNDS OF SOIL.

Substance applied	Treatment	CaCO_3 gain at end of eight weeks	Average	Grand Average
Burnt lime	No rain	19,282	.....	.....
Burnt lime	No rain	18,426	18,854	.....
Hydrated lime	No rain	19,204	.....	.....
Hydrated lime	No rain	18,432	18,816	.....
Burnt lime	Rain and watered	18,718	.....	.....
Burnt lime	Rain and watered	19,500	19,109	.....
Hydrated lime	Rain and watered	20,040	.....	.....
Hydrated lime	Rain and watered	18,604	19,322	19,025
Check - precipitated Carbonate	No rain	19,290	.....	.....
Check - precipitated Carbonate	Rain and watered	20,208	19,749	19,749

This is made clear by the data of Table II. Treatments have also been made in amounts as small as two tons and as high as one hundred tons, but those of Table II best suit our purpose.

These results were secured in the following manner: Four treatments of burnt lime, each of 8 tons per acre, and four treatments of slaked lime in exact chemical neutralizing equivalence to finely-divided, chemically-pure CaCO_3 , or precipitated chalk, were applied to an acid loam soil inclosed in metal cylinders in the field. The chemically-pure, fine carbonate checks were included to insure greater fairness of comparison with reference to influence of fineness upon chemical reaction. With these treatments were also made eight applications of ground limestone, the relationship of which to the fine carbonate we will later see. Each application was mixed with soil to a depth of 6 inches, being thoroughly incorporated in order to permit of soil sampling for chemical analysis. Periodic examinations of the oxide and hydrate treatments were made, once each week for eight weeks. During the first six weeks we found an increase of carbonate from CaO and Ca(OH)_2 , there being, however, no further appreciable increase of carbonates during the seventh and eighth weeks.

The data show practically complete carbonation of the applied burnt and hydrated lime. A vast array of data, which it is not necessary to give here, has further shown that where we apply burnt lime and leave it upon the surface, it will be more quickly carbonated than it could be if it were incorporated in the soil. Now suppose we were to apply burnt lime to a dry soil mulch; the burnt lime could not combine with the dry mulch, but it could and would be carbonated. We then have the carbonation of applied lime before its admixture in and reaction with the soil. It is apparent, then, that instead of incorporating burnt lime into the soil we are, in fact, making a treatment of calcium carbonate in its finest possible form. But, suppose we have considerable rain immediately after we apply our lime. We then have a movement of lime, partly as lime water and partly as carbonate in solution of carbonated water, down into the soil; where, under some conditions, part will react with the soil and be fixed, while under other conditions part will be leached away. Now in case of the amounts of lime ordinarily used in practice — say two tons — whether the lime be first completely carbonated or not, with the occurrence of sufficient soil moisture we have but a small fraction of the applied lime, if any, remaining long in the soil as carbonate.

It has reacted with certain substances in the soil and has become fixed or held in combination therewith as part of a product less easily leached, but still available to plant growth by a chemical reversal of the process which we have just considered. This conclusion is based upon data and is not a deduction from an assumed premise.

COMPARISON OF FINEST CARBONATE WITH GROUND LIMESTONE

Let us consider the relative reaction of ground limestone and calcium carbonate from the three sources, as given in Table II. Simultaneously with the treatments of Table II, eight lots of soil were treated with chemically equivalent amounts of commercial limestone of the following mechanical analysis:

TABLE III.

MECHANICAL ANALYSIS OF LIMESTONE

All through 10 mesh	
10 mesh—2 m.m.	30.69 per cent.
2 m.m.—1 m.m.	18.75 per cent.
1 m.m.— $\frac{1}{2}$ m.m.	18.55 per cent.
Less than $\frac{1}{2}$ m.m.	32.01 per cent.

The burnt lime, hydrated lime and fine carbonate treated soils were analyzed weekly during an interval of eight weeks; and, although they were exposed, not sufficient rainfall occurred to effect leaching. Seven months after the time these analyses were made, the eight ground limestone soils were analyzed for carbonates. The analyses are given in Table IV.

COMPARISON BETWEEN THE ACTIVITIES OF 8 TREATMENTS OF GROUND LIMESTONE AND THE AVERAGE OF 4 EACH OF BURNT AND HYDRATED LIME, AND 2 OF PRECIPITATED CARBONATE, UPON AN ACID SOIL.

Substance applied	CaCO ₃ gain per A. 2,000,000 lbs. of soil at end of 9 months	Average
Ground limestone	20,404	.....
Ground limestone	21,264	.....
Ground limestone	22,232	.....
Ground limestone	20,318	.....
Ground limestone	24,082	.....
Ground limestone	22,545	.....
Ground limestone	19,459	.....
Ground limestone	24,445	21,845

CaCO₃ gain per A. 2,000,000 lbs. of soil at end of 8 weeks.

Burnt lime, hydrated lime and precipitated chalk (10 treatments)	19,387	19,387
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The data of Table IV show that after being subjected to seven months of leaching by winter rains, there was still more residual carbonate of lime from the application of ground limestone than was found from the more active finely divided carbonate applied, and that formed from the carbonation of burnt and hydrated lime, though none of the latter was leached prior to analysis. Here, again, one may say, Is this not conservation? On the contrary, No; for, when dealing with an acid soil and the usual lime applications, the beneficial results come from the lime which reacts with the soil to neutralize lime requirement, and not from that which is leached away and lost. This raises the question as to the doubtful value of lumps of limestone remaining in a soil which is acid.

Physical betterment occurs in speed and extent in proportion to the solubility of the carbonate. Hence, we sometimes secure physical betterment more extensively from burnt lime than from equivalent amounts of CaO as ground limestone.

Let us now turn from these results where the limestone had been in contact with the soil for but a relatively short time and consider the case of the Pennsylvania Station plats at the end of thirty years of liming. In the Pennsylvania experiments two tons of almost pure lime have been applied each year to one of the 4 tiers, the one growing corn, while two tons of ground limestone of corresponding purity have been applied each year to the tiers growing corn and wheat. Each tier then received 2 tons of burnt lime every fourth year, and two tons of ground limestone every second year. Thus, all the burnt lime of each application has been exposed upon one series of plats, while the ground limestone has been subjected to leaching from twice the soil area. That is, in each rotation of corn, oats, wheat and grass, the entire amount of burnt lime was applied to the corn, while one half of the ground limestone was applied to each the corn and wheat. The results obtained after thirty years of liming are given in Table V which show in a very convincing manner the fact that, in spite of the increased solubility of burnt lime after carbonation, we do not lose proportionally more of the base when it is applied in the oxid form than when applied as limestone. Furthermore, in practice different conditions would exist. Practically all of the

burnt lime as ordinarily applied would combine with the soil and be held rather than leached. This "fixing" insures longer periods of plant response than would ensue, were the leaching more extensive than the fixing. Citation could be made to plats, long since free of burnt lime or its carbonate, which continue to give benefits from the liming. In other words, in ordinary practice, usually less of burnt lime is applied than the amounts which a soil is capable of fixing and holding in forms other than those of hydrate or carbonate.

TABLE V.

COMPARISON BETWEEN CONSERVATION OF LIME APPLIED AS CaO AND THAT APPLIED AS FINELY GROUND LIMESTONE. COMPOSITES OF 4 TIERS. TOTAL AVERAGE CaO AS BURNED LIME, 31,000 LBS.; AS GROUND LIMESTONE 36,960.

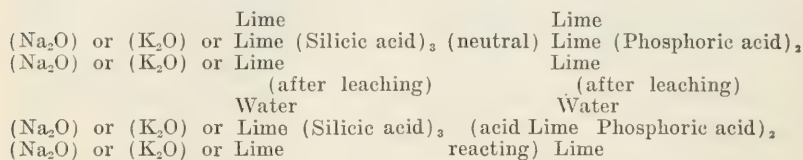
Treatments	Burnt Lime and 6 Tons Manure	Burnt Lime	Ground Limestone
CaO gain in 21 inches, as total CaO lbs. per A.	19,536×	17,793	21,088
CaO gain in 21 inches as CaCO ₃ per A.	11,766=	10,703	13,542
CaO gain in 21 inches as other forms lbs. per A.	7,770X	7,090	7,546
CaO gain in 21 inches as total CaO per cent of application.....	63*	57 4	57
CaO gain in 21 inches as CaCO ₃ per cent of application.....	37.9//	34.5	36.6
CaO gain in 21 inches as other forms per cent of application.....	25.1 XX	22.9	20.4
Using manure	×17099	*55.1	
Treated plats	= 9501	//30.6	
As checks	X 7598	XX24.5	

But, suppose we use ground limestone containing some pieces of appreciable size. Being less soluble, it will react less extensively than burnt lime, and we would still have limestone remaining. In other words, a good portion of the coarse limestone is not only not available immediately, but is probably never utilized. Hence, in many cases, we may not receive maximum possible increase per cent from applied CaO as limestone, because though in part removed or reduced, the soil acidity has not been sufficiently reduced or entirely overcome. This means that acidity or rather acid reacting materials still exist uncorrected or unneutralized, although some of the limestone is still present and subject to leaching by carbonated water. Again, would this condition tend toward conservation of total lime? It would not.

Let us see why. In the case of *rock derived soils* which are at present strongly acid, or rather of high lime requirement, we find the leachings to be always alkaline. Why is this the case? When the soil waters leach from soil they are impregnated to a greater or less degree with a gaseous substance. Water so impregnated not only will not permit of the acid-acting soil material extracting lime from its solution, but it will even make the soil more acid by removing additional bases. This base removing process accounts for the major portion of the soil acidity or lime requirement. It is analogous to the action of sulphuric acid upon tri-calcium phosphate, by which process the acid takes away a part of the lime and leaves a salt which is lime-hungry and anxious to recover and re-unite with its lime of which it was robbed. So also we have in the soil acid salts, principally silicates which have lost part of their lime, and also other bases. Because of the loss of bases the soil has an affinity for lime which serves to replace them. Probably this illustration will serve to clearly show the case in point. In the laboratory we took an acid soil, one which decomposes a considerable amount of lime. A solution of this soil in distilled water contained neither acid nor alkali. It was then treated with carbonated water and filtered, a process comparable to leaching under field conditions. The filtrate of carbonated water from this acid soil was decidedly alkaline. The filtrate secured this alkaline material from an acid soil, and by so doing the acid soil became still more acid. This was shown quantitatively by determining the lime requirement of a soil, or the extent of its ability to combine with CaCO_3 , both before and after leaching. The increase in the lime requirement of the soil after leaching was almost exactly identical to the amount of bases leached out. Furthermore, in sections where soils are notoriously acid, our surface waters, as well as our underground waters, are always alkaline, except in such cases as water flowing from swamps, or from some isolated regions where minerals capable of forming soluble acids are to be found.

In rock-derived soils we know acidity attributable to organic sources to be negligible in most cases, and we know that with increasing amount of clay in soil we have increasing acidity. It is, therefore, apparent that our acidity, or need of lime as a soil

amendment, is due largely to acid silicates which are formed during the leaching process. These acid silicates neutralize lime just as do the acids. The acid silicate formation is represented by the following equation, simply expressed, together with its analogy, rock phosphate:



Now the neutralization of lime requirement, which is in reality the fixation or decomposition by the soil of applied carbonate of lime through reaction with such acid salts, transpires both extensively, if not entirely, when leaching is not transpiring, and when the free-moving soil water is not heavily impregnated with carbonic acid gas. In other words, if in the laboratory we shake up a mixture of carbonate of lime, soil and distilled water, we get a greater decomposition, fixation or neutralization of lime than we do if carbonated water be used instead of the gas free water. This, then, is what theoretically becomes of the lime which we apply.

FIELD DATA

Having thus considered the influence of source upon fineness and that of fineness of the carbonate upon reaction with and conservation in soil, we come to the meagre available supply of field data.

Since the Pennsylvania Station results were obtained from amounts of CaO and ground limestone not chemically equivalent, together with the fact that the treatments are excessive and not equally distributed, we have in so far as we know only the results of the Rhode Island and Cornell stations. These we are able to give through the courtesy of Doctors Hartwell and Lyon for their respective stations.

TABLE VI.

RHODE ISLAND STATION RESULTS

Comparison between constant amounts of CaO in the form of ground limestone of varying degrees of fineness—burnt lime as check. All lime from same rock. Complete fertilizers applied throughout, both years.

Treatment	1913 Mangels, Lbs.	1914 Carrots, Lbs.	Total Yield, Lbs.	Total Increase, Lbs.
No lime	107	175	282	
Limestone 10-20 mesh.....	138	314	452	170
Limestone 20-40 mesh.....	204	469	673	391
Limestone 40-80 mesh.....	280	480	760	478
Limestone finer than 80 mesh....	389	563	952	672
Limestone unsifted.....	279	470	749	467
Slaked lime.....	364	573	937	655

TABLE VII.

CORNELL UNIVERSITY STATION RESULTS

Yield of crops. Percentage deviation from normal yields

Treatment,	Application per A				1914 Mangels	1911-14 Average
	Gross material pounds	CaO pounds	1911 Sorghum	1912 Oats	1913 Wheat	
Caustic lime.....	3,000	2,895	14.8	37.7	12.4	25.4
Limestone (50 mesh)...	6,000	2,880	8.0	37.3	7.2	18.0
Caustic lime.....	1,000	965	3.1	14.5	-2.6	5.0
Limestone (50 mesh)...	2,000	960	2.3	17.2	-0.5	5.9
Limestone (10 mesh)...	1,850	959	8.2	7.0	3.2	5.4
Limestone (200 mesh)...	1,800	979	6.7	12.4	-0.3	6.9

(Discussion of results included in Tables VI and VII.)

In a summation of the activities of lime, this must be understood: the finer the lime carbonate the more soluble it is, and, hence, the quicker and more extensive is the ultimate reaction between it and the soil. The chemistry and the economics resolve themselves into the fact that the largest amount of the finest form of lime, for the expense of obtaining and applying, is the form to apply. In making calculations it should be borne in mind, however, that in practice, ideal conditions of usage are probably not obtained either in the use of hydrated lime or when using ground limestone.

THE AGRICULTURAL LAW PERTAINING TO FARM LABOR AND
FERTILIZERS

GEORGE L. FLANDERS

For the matter presented by Mr. Flanders, See Bulletin 72,
Agricultural Law, 1915, accompanying.

Farm labor, page 1885.

Fertilizers, pages 1871-1875.

MARKETING

PROFESSOR BRISTOW ADAMS

- a. Better Understanding of Consumers' End.
- b. Standardization of Products.
- c. Organization at Producers' End.

No less an authority than Dean Galloway has said that "most of the pressure to secure changes in the methods of distribution and marketing of farm products has come not so much from the farmers as from non-producers who are feeling the pinch of the increasing cost of living." My own experience has led me to realize the truth of this.

My whole talk tonight is based on that experience, which came to me before I had any theories to expound, and before I had studied the question of marketing at all, except as the subject entered into a discussion of the cooperative disposal of the products of the farmer's woodlot. I had seen how foresters were insistent on the methods of increasing and improving woodlot production, but I could not see what good it did a farmer to raise more or better timber if he did not get an adequate return for what he produced. In that case I went into the economics of the situation with a fair amount of thoroughness, and read all the literature I could find, from authorities in this country and those abroad. It seemed to me that the theories propounded were generally applicable in all relations where the seller and the buyer were, respectively, the producer and the consumer.

Some of these theories fitted into an actual experience I had as manager, treasurer and secretary of a cooperative group of buyers in the city of Washington.

THE CONSUMER'S END

It was there that I learned to appreciate and to understand the difficulties at the consumers' end, which is the subject of the first division assigned to me tonight. Before going into details, it is well to state one plain fact: The more the consumer and the producer know of each others' problems, the more likely they are to

make concessions and to get together on a satisfactory basis. As long as both stand off and eye each other askance, and think only of the one selfish side of the proposition, there is no hope of satisfactory adjustment between the two. At present the main difficulty to be overcome is this lack of mutual understanding and agreement.

I shall not deal with theories, but with plain facts as I found them. In the first place this group was made up of government employees who needed to economize, but who were willing to pay a reasonable price for quality. The company was organized on a business basis, with shares of stock so low that anyone could join. Each stockholder had one share of voting stock and one vote only. We felt that in a true cooperative enterprise it was the man that counted and not the dollar, and we could not see how pieces of minted metal had any more brains or ability to control affairs than pieces of furniture, or any other inanimate objects. Anyone was privileged to put in all the money he wanted, and money was paid its legitimate hire in the way of interest; it was not permitted to do the hiring or to otherwise control the organization. I mention these details to give you to understand that we did not have an organization which was cooperative in name only.

When I think of some alleged cooperative enterprises I am apt to paraphrase a certain well-known quotation, and make it read "O Cooperation, what crimes are committed in thy name!"

But we tried, through patient study and care as to details, to work out a system which would bring the consumer and producer together. We were the consumers, and were our own middleman.

What were some of our successes and failures, difficulties, and solutions? In the first place, since we are now discussing the consumer, let us see what we found.

DIFFICULTIES OF CONSUMERS

First, there were those who had no idea of what cooperation meant, and who demanded special favors. Eventually they dropped out; and other troubles inherent to the frailties of human nature had to be eliminated gradually through similar action.

Second, there were the difficulties that beset the ordinary city-dweller who cannot buy in quantity, because there is no place to store a barrel of apples or even a peck or so of potatoes. Even where storage was adequate there was a general objection to bringing into the house more than enough for the next meal, because of the petty thievery of servants, who felt it was a perquisite of the job to take all that was not immediately needed or consumed by the family. Literally, many city-dwellers live from hand to mouth. This is a feature that the country-producer, with ample cellars and bins, and a whole winter's supply of food, cannot readily understand. But with a majority of consumers, at least in the city, it is impossible (or appears to them to be impossible) to purchase much more than a day's supply ahead.

THE COSTS OF SERVICE

A necessary result of this is that there are large charges for service and for storage, which the consumer must of course pay. Some of these charges are unnecessary, but will exist as long as present economic systems of distribution continue in force.

A favorite example of the economists, and indeed, one of the a. b. c. theorems of those who advocate municipal control of municipal activities, is the question of milk deliveries. Under present arrangements there is sheerest waste of service due to too much competition. Milk delivery wagons cross and recross the paths of one another, and five different distributors may deliver milk in five houses standing next door to each other, whereas one could do the work more cheaply and effectively. This effectiveness could be brought about if all the companies consolidated, or if the city organized a central milk depot with deliveries by area units or districts. How the city man can get milk for eight cents a quart is beyond my comprehension. That he does is a tribute to the farmer, the transportation company, the milk dealer, and the individual milkman. A careful study of the cost of milk production, made by the New York State College of Agriculture indicates that "at least one-eighth of the dairy herds in the state return an annual net loss to their owners." Under the most favorable conditions of cheap feeds and good markets the farmer makes between one-half and two-thirds of a cent as his share of profit on the eight cents the consumer pays.

The middleman is usually supposed to get more than his rightful share. He occupies a shadowy — one might almost say a shady — realm between producer and consumer, — a twilight zone into which the producer and the consumer equally pay tribute for nothing at all. This is not a fair statement, but it reflects the popular idea. The world will never get rid of the middleman. He is a necessity; and, while some of him may go, his place is fixed in the scheme of marketing and distribution, and his services are necessary.

Some maintain that the retailer gets too much. I think he does, because of too much overhead charge, too much competition; but he usually does not get more than he must have to make a living. I know from my own personal experience that under usual conditions in most cities and towns, the retail grocer can not survive unless he gets an average gross return of 20 per cent on his goods. In other words, he must get at least \$1.20 for every \$1.00 he spends for goods, or he will go to the wall. In Ithaca, because of the peculiar services rendered, the long hauls, the great variety of goods to be handled for an exacting buying public, and the money tied up in credits, I doubt that a grocer can get along on less than a gross return of one-fourth of the money paid out for stock-in-trade.

We found out that most consumers were more insistent on quality than on low price, though they thought that they should have a low price because we dealt with producer and manufacturer directly.

For example, the backbone of our entire business was an excellent grade of butter put up by a cooperative creamery, run by Danes in Litchfield, Minnesota. We paid for direct shipment in refrigeration car one cent more than the highest quoted price on the New York produce exchange on date of shipment. Seller and buyer had the quotations, and there was never any question about fairness of price. It was sold to our members at a three cent advance over the price paid. When butter was low we therefore made a proportionately greater profit. When butter was 38 in New York we settled with the creamery at 39, and our members paid 42 cents. A cheaper butter at five cents less had very little sale, maybe 20 pounds a week; whereas our Litchfield butter averaged more than 400 pounds a week.

Eggs came from nearby producers. We had a good market at fair price, but the poultryman killed the business that turned their eggs to gold. They wouldn't play the game. But that belongs in another part of the discussion, though it bears a relation to the next topic, the standardization of product.

STANDARDIZATION OF PRODUCTS

Standardization of products is the basis of any satisfactory arrangement in merchandizing, and the sooner the farmer learns that, the sooner will he be solving the whole question of marketing.

It was because our eggs were not standardized that we lost much of our trade. One of the most recent publications of the Federal Department of Agriculture is devoted to this question of standardization as it affects a single product — cantaloupes. "If serious loss is to be prevented," it says, "a great improvement must be made in the average quality of the fruit shipped to market. More uniformity in containers would eliminate a great deal of market confusion, and the most active demand is for melons uniformly graded and packed, of standard size, put up in standard containers holding forty-five melons. The shipment of 'off-sizes' is usually unprofitable to the shipper, serves to clog the markets, retard sales, and lower prices on all grades."

What is true of cantaloupes is equally true of all farm products. Take apples: Why does the New York Central Railroad dining car service, running through the finest apple region in the world, advertise on its bill of fare "Oregon apple — 15 cents?" Because the only Oregon apple that gets East is standardized as to size and appearance and is put up attractively. Yet the best Oregon apple is no better than the best New York apple, and in my own opinion is usually not so good in flavor. But New York apple producers have not come to the point of saving culls for home consumption, and of making the fancy consumer pay for a fancy wrapper.

Value of Standardization

Our organization attempted to standardize eggs, or at least to sell eggs which were to come to us as a standardized product. For example, our members obtained from the poultry experiment station of the Federal Department of Agriculture at Beltsville, Maryland, all of the eggs produced by that station at the time when the

department was testing out various parcel post containers. These eggs were in good demand, and we paid for them several cents above the prevailing market price, and yet were able to furnish them to our members at something less than the prices charged for the same kind by the best dealers.

By personal visits and inspection we got in touch with various nearby poultry farms, which contracted to furnish a certain number of dozen eggs per week. To these farms we paid more than they could get from any other source. And yet, because we could minimize the cost of distribution to our members, we were able to furnish the eggs to them for somewhat less than they would have to pay for the same product elsewhere.

The eggs were to be graded as to size (we had educated our members out of their prejudices in regard to color), were to be strictly fresh, and infertile. With the growth of our membership, and the excellence of the products which we furnished, there was a natural growth in demand.

The poultry producers who supplied the eggs, speaking plainly, did not play fair. Instead of furnishing us with just such eggs as they could guarantee, leaving us to seek elsewhere to keep up with the additional demands, they went out into the hedges, the highways, and byways, and gathered in all the eggs that they could, with the idea that they could dump them on us at the advanced price which we were paying. About two deliveries of such eggs practically killed the whole business, and we had to begin at the bottom and work up another plan, which was expensive and rather trying. That was to have each individual who furnished eggs send them in a special carton, which we furnished, and in which his name or number was written. Then, if there was any question about the quality of the eggs, they were thrown back on the individual who was responsible, and this made a good deal of trouble. These same nearby farmers wished us to sell butter. They had no notion of putting it up in attractive or uniform packages. In our effort to help the farmers' end we sustained some losses, and had to make ourselves parties to a practice in which we did not particularly believe. Most of the butter which we received from farmers was not good, and we were fortunate to get 20 cents a pound for it from the makers of the renovated product.

The experience of the Ithaca city market and of the market recently established at Olean, where producer and consumer come directly in contact, indicates that such markets promote a grading and standardization of products by the educational process of object lessons. A producer, seeing his neighbor's stand bring better prices because the material is better graded and handled, is stimulated to grade his own produce and to see that it is handled in a more sanitary way. The experience of both of these places has been that standardization is greatly needed.

The size of bunches of various vegetables should be made uniform, although from the standpoint of the consumer, competition in quantity as well as competition in price has its advantages. But to build up a permanent patronage in such a market the producer must standardize his produce and make good anything which is defective. The best way to do this is to see that nothing is defective in the first place.

ORGANIZATION AT THE PRODUCER'S END

While I am not so familiar with the work which has been done in organizing producers, I have made a study of certain enterprises; and, in trying to find the best goods for our consumers' organization, and also in aiming first of all to deal with cooperative producers' enterprises where possible, I have had some experience in this line also.

The easiest problem, with the producer, is where an entire community raises one staple crop. One of the best examples of producer's cooperative marketing is based on just such a type of agriculture near Bowling Green, Kentucky, where strawberry producers, thoroughly organized in a cooperative enterprise, have raised one type of strawberry, receiving their plants from Three Rivers, Michigan, all of the plants being bought at one time and in multiples of 500,000 lots. The product is marketed during the berry season, not merely by carload lots, but by trains per day, and practically all of the business is handled through one central organization.

A cooperative creamery at Hickory, North Carolina, furnishes eggs and butter, aiming to get more or less directly in touch with the consumer. Its work has been successful because, in the frank

words of its secretary, they use all the bad eggs themselves. In both cases the matter of standardization comes in. Some of the large western producers' organizations, as well as the Florida Citrus Exchange, are, however, not in any sense organizations of farmers, but selling organizations which hire out their ability to market the various products, with certain restrictions as to the grading of the material to be sold. They are in this respect equivalent to the Keen Kutter tool organization. So far as I know there is no Keen Kutter factory, but the advertising and selling organization allows the branding of the products of various factories with its trade name, and these products are marketed as being up to what is known as the Keen Kutter standard.

Where the product is diversified, the difficulties of cooperative organization among producers are proportionately increased, and the chance of keeping the channels clear between the producer and consumer are equally decreased. It is here that the organized selling agencies which have grown up between producer and consumer will get in their heaviest work. According to the New York State Food Investigating Commission, there are five to thirteen separate profits attached to a chicken, or a head of lettuce, on their roundabout journey from farm to kitchen, with the consequence that both chicken and lettuce get to the housewife's kitchen higher in price and lower in quality.

These clogged channels make very devious courses. I think it was at last year's meeting of the State Vegetable Growers' Association that one man told of lettuce shipped from Batavia, New York, to Boston, Massachusetts, and back to Batavia, and there sold in the market at a price lower than the home producer thought he ought to have for getting his lettuce into the Batavia home market.

The New York Commission's report stated that 40 cents of the consumer's dollar went to the producer, and the rest went into various hands. Take another example: An egg produced a mile from a certain city may travel several hundred miles, repose on the shelves of jobbers, in the cellars of commission men, in cold storage houses, on railroad trains, and in freight stations, only to get back near the original point of production much advanced in age and in price.

A favorite remedy which is being suggested is that the producer and the consumer shall get directly together. There shall be a bee line between them. This is not possible in our present economic system. The only place where it works out to advantage is in municipal markets, and even here it would be far better if all of the individual farmers did not take their produce into market, but used at home the time which would be taken in selling, for the production and improvement of their goods. After all, there is no truer statement than that time is money, and that it is well to pay money to somebody who can save your time. The one fundamental fact, however, is that of all those concerned in the production, distribution and consumption of life's necessities, the producers and the consumers are the last to organize, and of these two the producers are in the rear. As a consequence the producer has suffered most.

Do not fear that the consumers will not welcome producers' organizations. They should include what the consumer wants most—a standardizing of farm products, honest weight and measure, purity and high quality, which would mean a better price for the producer and a lower cost for the consumer, because it would result in the elimination of all but the necessary middlemen, and the producer and consumer could divide the leaks that go to the unnecessary middleman.

In this connection, one problem continually faced our Washington organization: that there are always some producers who, in their eagerness to get a share of the unearned increment, expect to get it all. Equally there are some consumers who, in their eagerness to save the unearned increment, expect to save it all. A better understanding of both sides should lead to the point where the producer will gladly give the consumer a rightful share of the profits, if the consumer is doing his part in reducing the cost by sane methods of distribution. The consumer should be equally willing to share with the producer. I plead for the three-fold point of view—the producer's, the necessary middleman's, and the consumer's. There are surely enough profits made by the five to thirteen middlemen discovered in this state to allow a reasonable division.

What is the best way to get into the minds of all this broadness

of view? To my notion it must come about through an educational campaign, and a careful investigation of all phases of marketing, before rushing in on visionary projects. Every failure in cooperation at either end, due to poor business methods or wrong ideals, turns back the hands of cooperative progress. Furthermore, any producers' organization which has as its aim the notion of getting the best of the consumer is inherently wrong, and is therefore bound to fail. Likewise, an organization of consumers aiming to "put something over" on the farmer is equally at fault. The more each side knows of the other, the more likely are they to get together in true cooperation, where the results may be measured not merely in dollars earned or dollars saved, but in the training afforded in human brotherhood, on which rests all that is finest in citizenship.

THE PLACE OF THE FARM BUREAU IN AGRICULTURAL EXTENSION
WORK

C. B. SMITH

THE FARM BUREAU REPRESENTS AN IDEA IN AGRICULTURAL
EXTENSION

The idea is not yet perfected but it is fast taking shape. The outlines of its boundaries are being delimited and the thing that seemed visionary in the North three years ago is fast becoming a reality. I cannot show the change that is taking place more forcibly perhaps than by quoting from a speech made three years ago by the dean of one of our great agricultural colleges at an assembly of college men and farmers in the Middle West. Speaking of the farm bureau movement he said: "So attractive is this new scheme that it is sweeping men off their feet. Just at present we are engaged in the absurd attempt to place one of these demonstrators in every county of the United States. Federal and state aid and private patronage are all invoked to bring this about at once, regardless of the fact that men who can do this work as it ought to be done are unavailable. I regard this latest step as the most dangerous of all that have been taken in agricultural progress since the world began."

Since this address was made the number of farm bureaus in the North and West has increased from half a dozen to 380. Every agricultural college in the United States has accepted the idea; and the possibility of placing an agent in every county of the United States has been made practically certain by federal and state laws already enacted. I would not go so far at this time as to say that the hopes of those who initiated and fostered the work have been fully met. They have not. Probably not more than 50 per cent of the farm bureaus established in the North have as yet made good in any full sense of that phrase; but that fact is not discouraging any one. The work is yet new, and it is interesting to note that up to date not 5 per cent of the counties starting work in the North have given it up.

The idea of the farm bureau as understood by the leaders in agriculture is now fully accepted as right, and that idea is based

on the actual work that has been done by those bureaus, and the fuller understanding of what they may do when properly organized.

For the purpose of this paper a farm bureau is a county-wide organization of farmers associated together for the purpose of promoting, through study, cooperation and paid leadership, better agricultural practices, rural economics and country social life. The heart of the farm bureau is the county agent, or farm bureau manager, as he is called in this state, who, by cooperation and agreement, is usually also a representative of the state and the federal government in agricultural extension work. The farm bureau differs from other farmers' organizations in its catholicity of membership, its permanent paid leadership, the fact that its agent may also be a direct representative of the state and government, and the work is fostered by the state financially and otherwise. These would seem to be stabilizing elements in the farm bureau movement.

Most movements fail for want of leaders. The farm bureau movement aims to avoid this end through paid leadership. The state is cooperating to see that this paid leadership is competent, and is reinforced by all the help the state and federal government can lend in support of the work.

The question may be asked, Why are the state and government encouraging farm bureaus and cooperating in its work? The answer is simple enough. They are given millions of dollars every year to study and promote agriculture. They need an effective way of getting the results of their studies and the knowledge of the practices of the best farmers to every man on the farm, everywhere. The colleges and department may not need an extension organization to get before the people the really new things they discover in agriculture each year; bulletins, reports and the public press may be satisfactory for this. But, when it comes to the widespread distribution and adoption of the things already known among all farmers, the psychology of the situation demands a local study and closer contact with the people than that of publications or public address — a contact and local study that the agent of the farm bureau is in a better position to effect than by any plan heretofore put into effect.

I desire to emphasize here the importance in the extension plan which the Department attaches to the study and distribution of good local practices — the carrying from farmer to farmer of the best things the community itself has worked out. It is not generally appreciated, I think, that in the North practically every community has worked out successful practices and systems of farming, which, if more generally observed by farmers, would result in a greatly improved agriculture in the community. This fact is unusually well brought out in the farm management demonstrations made during the year with 140 groups of 70 farmers each. These demonstrations were made in 140 counties, and in cooperation with 140 county agents distributed from Maine to Oregon. They show that in practically every community of farmers surveyed, approximately 20 per cent of the farmers were paying interest on their investment and making \$1,000 a year labor income more than the average of all the farms in the community. Also, in those same communities there were more than 20 per cent of the farmers, if allowed interest on their investment, that were not getting a single dollar for the entire year's work, and must largely live off their interest money if they have any income at all. So general have these demonstrations been in accord on this point, and so rare the exceptions — not one to my knowledge — that I am inclined to think that this is a fairly general truth throughout the greater part of the northern and western states — that practically every community has worked out successful methods and systems of farming, which, if generally practiced in the community, would make the community unusually prosperous.

Whether this is a general truth or not, it emphasizes this point: that in making a special effort to learn and spread local practices which have been proved effective, farm bureaus are starting out on a most logical and promising plan. It is a sound plan because the practices thus spread are the ones that are proving financially successful. It is convincing extension work because the data are local. Now the impartial, disinterested, analytical county agent, the employee of the farm bureau, is the best means yet suggested of recognizing these unusually successful farmers in each community, and of bringing to all the farmers of the

community, in a tactful, helpful way, the best things the community itself has worked out. This is a kind of extension work that is particularly the field of the farm bureau. It is a field that has not been occupied up to this time, and it contains probably the greater part of agricultural information of value that we are anxious to see extended.

With the amplification thus given of this phase of the county agent's work we may now consider the place of the farm bureau in a broader way in extension work. The function of the farm bureau, as we see the matter, includes these things:

1. To act as a clearing house for local agricultural knowledge.
2. To disseminate the agricultural knowledge of state and national institutions of agriculture.
3. To undertake cooperative and systematic plans for rural, social and economic betterment.

Defining the matter a little more in detail, a farm bureau teaches its membership the facts of local agriculture; organizes groups for particular purposes, such as cooperative marketing and buying, livestock improvement, etc.; puts into effect the teachings of state and government relative to agriculture, in so far as they apply locally; and cooperates in directing the state and government agencies in their agricultural extension work within the county, etc. All these things it does through organized study, demonstrations, field meetings, publications and the like.

Ideally the county farm bureau is an independent local agricultural organization. It is desirable that it be formed and directed by local initiative. It is desirable that its membership be representative of all the agricultural interests of the county. It is desirable that it cooperate with state and government in the employment of a county agent. It is not essential that it cooperate with state and government in the county agent. The county may employ such an agent without cooperation with these forces, and derive much benefit therefrom. This has occurred in a few instances in the North. However, since state and government have greater opportunities to discover and collect agricultural knowledge than the county, it is, in the long run, to the great advantage of the farm bureau to cooperate with these agencies.

For various reasons cooperation with farm bureaus by state and government along all lines of work which the bureau may desire to do, is not practicable at this time. On this account the cooperation of the state and the government with the farm bureau is quite generally limited to cooperation in the employment and the work of the county agent. He is the vital factor of the farm bureau. He is what makes the work of the farm bureau different from that of the Pomona Grange or other like organizations. He is the link that connects the work of the farm bureau with the agriculture of the state and government. With the agricultural interests of the county organized into a farm bureau, the county agent is the man through whom all extension work of the state and government is logically brought into the county. His big duties are those of organization and administration. Through him the extension specialists of the state and government are directed to the respective problems in the county, through him the state will arrange its short courses and movable schools, and through him it will plan its farmers' institutes. With his supervision the college will organize its club work with boys and girls in cooperation with the school system, and local clubs and societies will be formed to do particular things. He will be the inspiration behind those organizations in work and leadership. Through him agricultural movements and campaigns will be inaugurated.

As already noted, by means of financial cooperation and by agreement, the county agent is a representative of the state and the government as well as a representative of the county. When he becomes such an agent his acts are limited by the regulations prescribed by state and government, and his work in its final analysis is directed by the state and government.

This direction, however, when wisely administered is reduced to the minimum. Every encouragement is given the local organization to local initiative. It is recognized that the teacher teaches best who lets the pupils handle the tools and do the work themselves, and that the farm bureau will do the best work when it has a very large share in shaping up the work of the county agent and feels a responsibility for it.

Answering now the question as to the place of the farm bureau in agricultural extension work, I should say it is a connecting

link and a transformer or intensifier. Through it, as a connecting link, state and federal government will reach, in a more direct way than has heretofore been possible, the men and women on the farm, with the results of their studies and observations in agriculture. Through it, as a connecting link, the men and women on the farm may get into personal touch with representatives of the state and federal government, and get a clearer and more local understanding of the teachings of these great agricultural institutions.

The farm bureau will not replace any of the extension agencies now in existence. Instead, it will multiply the number and increase their effectiveness.

As an intensifying station the farm bureau will welcome the specialist to the county and multiply his effectiveness manifold by arousing interest in the work in advance, getting it located in strategical places throughout the county, and following it up after the specialist is gone. The farm bureau must have the help of the specialist, because the county agent is not necessarily a specialist except in organization and administration.

The farm bureau will welcome the movable school and make its work still more valuable because its agent, having a knowledge of local needs, will advise with the movable school authorities as to subject matter needed and special conditions to be met. It will help arouse interest in the work and organize the local machinery to do its part.

The farm bureau will welcome the farmers' institute and heartily cooperate with it in arranging its program to best meet the interests of the different farm communities, and be on the job permanently to see that the teachings of the lecturers are translated into the farm practice of the community.

The farm bureau will welcome the boys and girls' club work, and, through the county agent, cooperating with the school authorities of the county, it will help find local leadership and aid in adapting subject matter to local conditions.

On its own responsibility and acting independently and alone the farm bureau will raise funds to provide for emergency measures like prizes for fairs, for club winners and for special demonstrations. It will organize for standardizing, buying, and selling, for labor and produce exchange, community enterprises, etc.

As a partner with state and federal government, on the firing line, it will cooperate with those agencies as minute men in emergency matters pertaining to agriculture, such as foot and mouth disease, suppression of grasshopper plagues, control of plant diseases, etc.

And so we might go on. The possibilities of the farm bureau in extension work are almost limitless. From the state standpoint it is a local organization that state and federal government can cooperate with in all their agricultural extension work. In the big extension program the farm bureau is not going to replace any of the extension work now being done by these institutions, but it is going to localize and vitalize and give point to all our extension work; and that, it seems to me, is the chief place of the farm bureau in extension work.

REAL PROFITS FROM THE DAIRY BUSINESS AS MEASURED BY COST ACCOUNTING

PROFESSOR G. F. WARREN

The data for table I is from the same farms as those for which results were given by Professor Thompson on pages 4 to 8. The methods of calculation are the same as there given. The work is being done in cooperation with the Office of Farm Management of the United States Department of Agriculture.

Before one is ready to interpret cost accounts he must know the methods of calculation, and should know what to expect from an industry. From any industry that is not a monopoly we should expect to pay wages and interest on the capital invested. By interest is meant the usual business rate of interest. Probably government bonds give the nearest indication of the true rate for the use of money without risk of loss. Farm interest of 5 or 6 per cent is higher because there is more risk for money thus invested.

One should not expect more than interest and wages, on the average, although many individuals make more. We are particularly interested in seeing how they do it. With this point of view one should not expect the average crop or animal to show much profit by the method of cost accounting here used, because interest and wages, use of buildings, and all other costs, have been included. Many persons think that agriculture should pay much more than this; but it can not do so except temporarily, for as soon as it is evident that the farms are paying more than interest at the farm rate and farm wages, the price of land promptly rises to take up the slack, or wages rise, or cows sell for more. In some way an adjustment takes place that again brings the average profit to the normal one of wages and interest. You have all seen how rapidly such adjustments take place in the price of cows, and have seen the more tardy but no less certain changes in the price of land.

The usual assumption is that the aim of cost accounting is to determine what things pay, so that we may raise more of them; and what things fail to pay, so that we can stop raising them.

This is a superficial and erroneous view. Cost accounting is an analysis of the business. Such facts as quantity of feed used, its relation to the product, and time spent in comparison with other farms, are more important than a mere knowledge of profit and loss. For example, on one farm I found a loss of \$50 per cow. The facts were analyzed and compared with other farms. It appeared that the man was raising grade calves on milk that was too valuable for any but pure-bred stock. His herd was small, hence the labor item was high. The more prominent facts showed that if he increased his herd, and either raised no calves or pure-bred ones, he might expect a profit. The herd is now on a paying basis. The wrong and superficial advice would have been to stop keeping cows. The correct advice was to keep more of them. For every case where one would be wise in dropping a product that does not pay there are many cases where he should continue to produce it, but give his attention to those things that will make it pay.

If one finds that a certain product is paying well it should be studied just as carefully as one that does not pay, because it may be possible to make it pay better.

If an account indicates that a crop or animal does not quite pay, and if there seems to be no possible way of making it do better, it may still be grown if it comes at a time when there is not other work to do.

A survey of the costs of producing milk in various regions are given in tables I, II and III. Little comment on these is necessary except to remember that the other items than dollars are the ones that deserve the most study. Notice that in as widely different conditions as the intensive dairy region of Delaware County, New York, and the dairy farms of Minnesota where Shorthorn cattle are much used, the costs other than feed are not strikingly different.

Also compare the pure-bred and grade herds in New York. Notice that every item of cost is higher for the pure-bred herds. If a farmer has a single pure-bred cow in a herd he may give her the same care as he gives the grades. But even then he is likely to give her a little more grain, and he will certainly spend more

on her if she is sick. However this may be, it is evident that every item of expense is more for pure-breds than for grades; but the amount of milk produced is larger, and the total value of the milk and stock makes pure-breds on the average more profitable.

TABLE I

DAIRY HERDS IN NEW YORK; PRELIMINARY FIGURES, SUBJECT TO REVISION

<i>Quantities:</i>	Grade Herds		Pure Bred Herds	
	1913	1914	1913	1914
Number herds	17	8	5	4
Number cows	297.5	189.6	110.5	85.5
Number cows per herd.....	17.5	23.7	22.1	21.4
Number cattle unit per herd.....	23.9	30.9	32.8	36.3
Average value of cows.....	\$71.10	\$70.31	\$215.90	\$268.89
Pounds milk per cow.....	6185	5584	7000	7388
Value milk per cow.....	\$99.46	\$86.42	\$107.70	\$105.10
Pounds grain per cattle unit.....	1551	1479	2339	2295
Pounds dry forage per cattle unit..	3028	2480	3216	3200
Pounds silage per cattle unit.....	6554	5540	6791	8980
Hours man labor per cattle unit...	116	100	161	183
<i>Cost per cattle unit:</i>				
Grain.....	\$22.71	\$18.99	\$34.18	\$34.24
Dry forage	17.76	12.90	23.00	16.88
Silage, etc.	12.90	11.74	14.33	17.47
Pasture.....	4.96	4.43	4.52	4.15
Bedding.....	2.22	1.33	2.55	2.70
Man labor	19.26	16.63	27.86	30.76
Horse labor	2.64	3.77	3.22	2.31
Equipment labor	.91	.76	.97	.79
Interest.....	3.55	2.95	11.21	15.90
Buildings.....	2.81	2.04	2.34	3.27
Breeding fees	.003	.36	8.21	1.76
Veterinary and medicine.....	.20	.09	.55	.59
Miscellaneous.....	2.13	1.95	6.92	10.16
<i>Summary:</i>				
Feed	\$58.33	\$48.07	\$76.03	\$72.74
Man labor	19.26	16.63	27.86	30.77
All else	14.46	13.26	35.97	37.48
Total.....	<u>\$92.05</u>	<u>\$77.96</u>	<u>\$139.86</u>	<u>\$141.00</u>
<i>Returns per cattle unit:</i>				
Milk	\$72.81	\$66.24	\$72.61	\$61.73
Increase and net sales.....	18.02	13.37	87.01	90.47
Manure.....	10.59	7.87	10.11	10.12
Miscellaneous.....	.39	.06	1.79	1.95
Total	<u>\$101.81</u>	<u>\$87.53</u>	<u>\$171.52</u>	<u>\$164.26</u>
Profit per cattle unit.....	<u>\$9.76</u>	<u>\$9.57</u>	<u>\$31.66</u>	<u>\$23.27</u>

TABLE II

COST OF PRODUCING MILK IN RICE CO., MINNESOTA, AND IN DELAWARE COUNTY, N. Y.

	Delaware Co., N. Y.* Per cattle unit	Rice Co., Minn.† Per cow
<i>Quantities:</i>		
Pounds grain fed.....	1662	864
Hours human labor.....	130	133
Pounds milk produced.....	3747	5252
Pounds butterfat produced.....	173	188
<i>Cost:</i>		
Grain	\$26.00	\$27.50
Roughage	37.12	
Pasture	3.48	
Bedding	.75	\$
Buildings	4.41	2.46
Dairy equipment	.41	.58
Interest	2.94	2.35
Human labor	18.26	18.66
Horse labor	.20	
Hauling milk	5.01	
Bull cost	‡	1.98
Depreciation	‡	3.19
Miscellaneous	.91	3.28
Less cattle increases and net sales.....	.92	....
Total cost	\$98.57	\$60.00

* Report of the proceedings of the American Farm Management Association, November, 1913.

† Minnesota, Bulletin 124.

‡ This item included elsewhere.

§ Charge for this item not given.

TABLE III

FEED COSTS AND OTHER COSTS

	Feed costs	All other costs
Minnesota costs per cow.....	\$28	\$32
Delaware county costs per cattle unit.....	66	32
Grade herds 1913 costs per cattle unit.....	58	34
Grade herds 1914 costs per cattle unit.....	48	30
Pure-bred herds 1913 costs per cattle unit.....	76	64
Pure-bred herds 1914 costs per cattle unit.....	73	68

WEIGHING MILK AND FEED

ELMER S. SAVAGE

WEIGHING THE MILK

Little that is new can be said on this subject. Every farmer knows that he should weigh the milk of each individual cow at each milking, yet few are willing to make this effort. All should be urged to do so at all times. There are two fundamental reasons for this.

1. The records made by weighing the milk of each cow at every milking will show the production of each individual. This data is invaluable. It establishes which cows are persistent in milk flow, and it enables the farmer to practice rigid selection. Further, and probably most important of all, it establishes a firm basis for sales. The statement of the production of his individual cows will be accepted from every farmer by his neighbors, if he is an honest man, even if these records have not been authenticated. Not enough attention has been paid to this point, which is the one new thing in this paper. Too much stress cannot be laid on it. A complete record of the production of his herd will enable a farmer to sell his stock, particularly the young stock, to very great advantage.

2. A knowledge of the daily production of his animals will enable a farmer to follow production closely with his feeding. Not enough attention is paid to this fact. The trouble of keeping records of individual production is fully paid for by the help gained in adjusting the ration of each individual.

WEIGHING FEED

The dairy business on most farms is too often considered just "chores." It is not studied and carried on with sufficient care. Although not so important as weighing the milk, it is worth while to weigh the concentrates fed. With the roughage this is not necessary. In general, a cow should get about one pound of concentrates for every three and one-half pounds of milk yielded, depending on the test of butterfat. If the test is high, one

pound of grain to three of milk should be fed; if low, one pound of grain to four of milk may be most economical. There are three reasons why it pays to weigh the concentrates.

1. It teaches exactness in feeding operations.
2. It makes the feeding uniform.
3. It is just as economical of time. One is more likely to vary the feed with production and with the individual, if he feeds by weight.

THE INDIRECT PROFITS FROM THE DAIRY

PROFESSOR J. L. STONE

I see four distinct ways in which dairying may be said to produce indirect benefits.

1. In the production of manure. I believe that there may be developed systems of farming whereby, with wisely planned rotation of crops, the use of catch crop and green manure crop, soil amendments and mineral fertilizers, coupled with judicious cultivation, we may maintain satisfactory crop yields indefinitely. Some farmers may have developed such a system, but their methods and results have not been heralded abroad. When we see farmers producing crops with the use of little or no stable manure we are safe in assuming that they are doing mining farming. They are depleting the stores of available plant food in the soil, and crop yields will sooner or later fall off, as certainly as the mine will eventually become "worked out."

Dairying results in the production of quantities of manure, which, if carefully husbanded and wisely utilized, will enable the farmer to produce fine yields of cash crops, as well as of forage crops, to the financial advantage of his enterprise. He will at the same time be maintaining or increasing the available plant food supply.

2. Utilizing non-salable products. On every farm growing a variety of crops there will always be some that will not be readily salable, or at least will be most profitably disposed of by feeding them on the farm. Clover hay, corn stalks, cabbage waste, straw, cull apples and potatoes, and apple pomace, may be most advantageously disposed of in this way. Not only is feeding value realized from them, but they are at the same time converted into much needed manure.

3. All-the-year-round employment. Primarily a farm is a place to work. The farmer's earnings correspond to the laborers wages. If he is a skilful farmer, and has a fair amount of capital at his disposal, his income should equal a skilled artisan's wages, but in either case the income will be largely influenced by the completeness of his employment throughout the year. Farm

management studies show that those farmers who plan their business so as to have productive employment at all times get larger incomes than those who do not. Dairying, more than most lines of farming, tends to distribute the work throughout the year. The winter care of a dairy herd entails much more labor than the summer care. It thus dovetails nicely with crop growing to give continuous employment throughout the year.

4. By-products of the dairy. In some forms of dairying the by-products contribute much to the success of certain other profitable lines of farming. Skim milk for feeding to young pigs is almost essential to success, no matter whether the purpose is to grow them to maturity for pork making, to sell them as breeding stock, or to sell them young for others to grow and fatten. Without milk, either skim or fresh, it is almost impracticable to raise calves, and lobbered milk is one of the most desirable foods for chickens. The whey from cheese making, though not so valuable as skim milk, is still often useful in feeding pigs.

These are some of the indirect benefits of dairying. It not infrequently happens that conditions are such that the direct profits of dairying are small—even nothing—yet the indirect benefits are such that the farmer feels that he cannot afford to give up his dairy on account of them.

HAS UNDUE EMPHASIS BEEN LAID UPON PROTEIN**1. VIEWS OF DR. W. H. JORDAN**

The various compounds of cattle foods are divided into the following classes: (1) water, (2) ash, (3) protein, (4) carbohydrates, (5) fats. The general functions of these five classes briefly summarized are as follows:

WATER

This forms quite a large part of the soft tissues of animals and acts as a carrier in the distribution of digested food to the various parts of the animal body, and also of wastes to the points of elimination.

ASH

The ash is the incombustible part of the animal body, and from its compounds is formed the bone. Ash compounds are also distributed throughout the soft tissues of the animal and fill an important place in the composition of certain of the digestive fluids.

PROTEIN

From the different protein compounds are formed all the soft and nitrogenous tissues of the animal body, including muscles, the nervous system, the main part of various organs of secretion, the lungs, and quite a large part of the dry matter of the blood. We speak of protein as a main factor in the construction of tissue and its replacement. When not used for these purposes it supplies energy for the maintenance of the internal and external activities of the animal body. In this latter respect, digested protein has an energy value about equal to that of digested carbohydrates.

CARBOHYDRATES

In ordinary cattle food mixtures the carbohydrates are the chief source of the energy used by the animal body. They may also serve for the formation of both body and milk fats. They can take no part in the construction of the real tissues of the animal body, since fat is not regarded as a tissue.

FAT

The vegetable and animal fats and oils serve as a source of energy for the maintenance of the activities of the animal body, being in this respect equal to about two and one-fourth times the same weight of carbohydrates. The fats of the food may also be utilized for the production of body fats, and to some extent perhaps of the milk fats.

We may consider the relative importance of these classes of ingredients in the animal economy from two points of view, namely, physiologically and commercially. Considered from the point of view of physiological necessities, these ingredients are all essential to animal growth and maintenance, and in this sense have equal physiological value. While the animal must have sufficient proteins to meet the demands for constructive and replacement purposes, it is equally true that it must have sufficient digestible food to supply the energy necessary for maintaining internal and external activities. A lack in either case is fatal, certainly to physical well-being and possibly to existence. A deficiency in either direction would limit the production of a milch cow or require the use of her body substance. The food of a given animal should contain no less than a minimum amount of protein. On the other hand, a milch cow giving thirty pounds of 5-per-cent milk utilizes daily sixteen pounds of digestible organic matter, at least eleven pounds of which would be applied to fuel purposes. If a fattening steer were eating the same kind of digestible food and gained two pounds of live weight daily, at least thirteen and one-half pounds of the sixteen would be oxidized for energy purposes.

Water is confessedly an essential ingredient of an animal's food, and the formation of bone and of the soft tissues, as well as the digestive processes, requires the presence in food of the compounds of the ash. It is not possible then to claim rationally that any one class of the ingredients above mentioned is supremely important to the growth, maintenance and welfare of the animal body.

The reasons why protein has been given such large prominence in our discussions of animal nutrition are largely commercial,

although undue relative importance has been laid upon the nutritive functions of protein. The great preponderance of the ordinary farm crops are made up largely of carbohydrate materials with a small percentage of protein. There is no crop that gives a satisfactory yield which carries a high protein percentage. The most important forage crop which today supplements the protein supply of the farm is alfalfa, but the percentage of nitrogen compounds present is not high. Peas carry a higher percentage but the yield is unsatisfactory as a grain crop, although used in the green state peas are a useful forage plant. When the German feeding standards were launched in this country, it was very evident that it would be difficult, if not impossible, to compound what was then called a balanced ration from home raised feeding stuffs. Farmers were urged therefore to invest in the protein feeding stuffs such as cottonseed meal, linseed meal, gluten feed and so on. In this way protein came into great prominence in public discussions, and the attention of cattle feeders was focused upon that as a greatly important factor in their feeding; but, as we see, chiefly for business reasons.

This exaltation of protein still clings to our literature, and, to a certain extent, to our commercial standards. This has been unfortunate, especially in relation to our so-called compound foods. The farmers have been told by those interested in the sale of proprietary feeds that, because one feed combination carries 20 per cent of protein, it is considerably more valuable than another carrying only 15 per cent of protein — a statement which may be either false or true. It is very important to consider not only the percentage of protein, but the materials with which this protein is associated. If, on the one hand, the protein feeds are supplemented by such materials as corn meal, hominy feed, wheat middlings and similar standard materials; and, on the other hand, by mill screenings, oat hulls, and other highly indigestible materials, it would be unfair and delusive to make a comparison on the basis of the percentage of protein.

Another way in which undue emphasis has been laid upon protein is in determining the relative economy of two feeds by charging up the total price of the feed to its protein content. It has been taught, for instance, that if on this basis the protein of

cottonseed meal costs four cents a pound, it is more economical to purchase it than some feeding stuff carrying less protein, where the pound cost of the protein is five cents. This method of charging up the full cost of the feeding stuff against the protein ignores whatever value the other ingredients of the feeding stuff may have. Now, if the home raised crops have no value to the farmer — that is, if he has no market for them and has a plentiful supply,— then any saving from the purchase of carbohydrate material in gluten feed would be of no advantage to him. But, if he can sell his hay, his oats, or his corn, it is irrational to assume that he is justified in ignoring the value of carbohydrates or fats in the feeds which he purchases.

I, therefore, conclude that undue commercial emphasis has been laid upon protein in two particulars: First, in measuring the value of compounded feeds, or of any feeds, solely by the percentage of protein present; and second, in computing the economy of the purchase of feeds by charging up the entire ton price of the feed against the protein present.

2. VIEWS OF DR. E. S. SAVAGE

In expressing his views on this subject the writer assumes that the question under discussion is the amount of protein to be purchased in the concentrates. No one questions the importance of growing all the legume roughage that it is possible to grow. The nitrogen and protein that is gained in this way is partly gained from the air at no cost whatsoever; therefore every bit that the farmer can get adds so much to the permanent value of his farm.

In addition to the roughage the farmer may perhaps grow some grain. Then the question comes to the dairy farmer, What feeds shall I purchase to supplement the roughage and concentrates I already have on hand? The answer is, buy concentrates that will yield total digestible nutrients the cheapest, and which will so adjust the ration that the nutritive ratio of the entire ration shall be not wider than 1:6.

The writer bases this answer on these facts:

1. Total digestible nutrients cost no more in high protein foods than in low protein foods.
2. In addition to 1, if the relative manurial values are given

any consideration at all, the total digestible nutrients are much cheaper in the high protein foods than in the low protein foods.

Statement 1 will be considered first. Total digestible nutrients should first be defined. To find the total digestible nutrients in any food add together the digestible protein, the digestible carbohydrates, and 2.25 times the digestible fat.

1. COST OF TOTAL DIGESTIBLE NUTRIENTS

The cost of one pound of total digestible nutrients has been computed in the following feeds:

TABLE I

Feed	Total dig. nutrients in 1 ton	Cost of one ton	Cost of 1 lb. of total dig. nutrients
1. Distillers' dried grains.....	1,778	\$32 96	\$.0185
2. Gluten feed	1,614	30 07	.0186
3. Corn meal	1,676	31 09	.0186
4. Hominy feed	1,692	31 59	.0187
5. Cottonseed meal	1,564	32 29	.0206
6. Barley	1,588	33 19	.0209
7. Wheat bran	1,218	27 26	.0224
8. Oil meal	1,558	36 75	.0236
9. Ground oats	1,400	37 55	.0268

In Table I, column 1 is the digestible protein + the digestible carbohydrates + (the digestible fat x 2.25) in one ton of each of the feeds named. The data is from "Feeds and Feeding," fifteenth edition, Henry and Morrison. Column 2, the ton price is the average price for the year October, 1914, to September, 1915. The quotations used were for the fifteenth of each month as quoted wholesale by a Buffalo, N. Y. firm in carlots f. o. b., Rochester, N. Y., Syracuse, N. Y., or Baltimore, Md. Column 3, the price of one pound of total digestible nutrients, is obtained by dividing column 1 into column 2.

The amounts of total digestible nutrients in one ton of each food is what is actually paid for in each case. Column 3, the cost of one pound of total digestible nutrients, gives a true relative basis for the choice of feeds to supplement those already at hand.

It also may throw some light on the question of selling some home-grown feeds and purchasing others to take their places. From column 3 it is seen that during the year 1914-1915 dis-

tillers dried grains and gluten feed were, on the basis of total digestible nutrients, relatively as cheap as corn meal and hominy, and actually nearly as cheap. This on the face of it shows that there is no need of putting less protein into the ration than the amount indicated by a nutritive ratio of 1:6, because total feed value is just as cheap in these high protein feeds as in any other feeds. This will hold for any year in the opinion of the writer. Therefore the thing for every feeder to do is to prepare a table like Table I from the list of concentrates that may be purchased. Then choose from this list those foods which will bring the nutritive ratio of his ration between 1:45 and 1:6, making the choice from those which will yield total digestible nutrients the cheapest. It is understood that such a choice will always be modified by a careful consideration of the mechanical condition and effect on the class of animals being fed, and all other considerations of this character. The point is that, under the present condition of the feed market, enough high protein feeds will be found among the five or six feeds, which are relatively the cheapest, to properly balance the ration.

2. MANURIAL VALUES

A consideration of the manurial values of feeds is important in its bearing on the questions discussed under the cost of digestible nutrients.

The net cost for milk production of a feed under any system of permanent agriculture is the first cost minus the value of the fertilizer constituents appearing in the manure from that feed.

If the urine and solid manure of the cow is properly conserved 75.5 per cent of the nitrogen (N) and 89.7 per cent of the phosphoric acid (P_2O_5) and potash (K_2O) is returned to the soil from that in the feed. The rest of the nitrogen, phosphoric acid and potash appears in the milk. Obviously, since the mature cow is neither gaining nor losing live weight, these are the only two outlets for the materials taken in in the feed.

Table II gives the amounts of nitrogen, phosphoric acid and potash appearing in the solid and liquid manure from a mature cow producing milk. These amounts are calculated by multiplying the amounts available in the feed, if it were spread directly on

the land as a fertilizer, by the percentages given above, 75.5 per cent of the nitrogen, 89.7 per cent of the phosphoric acid, and potash. Column 4 in the table is the total value of the fertilizing constituents in the manure. Nitrogen is valued at 18 cents, phosphoric acid at 4.5 cents and potash at 5 cents per pound.

TABLE II

Feed	Nitrogen pounds	Phosphoric acid pounds	Potash pounds	Value
Distillers' dried grains....	74.1	12.2	3.0	\$14 04
Gluten feed	61.3	11.1	4.1	11 74
Corn meal	22.5	10.9	6.6	4 87
Hominy ..	25.7	22.2	17.0	6 48
Cottonseed meal	106.6	47.9	32.5	22 98
Barley ..	27.8	15.2	13.3	6 35
Wheat bran	38.7	52.9	29.1	10 81
Oil meal	81.8	30.5	22.8	17 23
Ground oats	29.3	14.4	10.0	6 42

It will be seen from this table that the high protein feeds, cottonseed meal, distillers dried grains, linseed oil meal, and gluten feed, have a high manurial value per ton when fed to dairy cows. Objection might be made to these values on the basis that no such values can possibly be recovered with even the very best method of handling the manure. On this point, the writer quotes the following from the fifteenth edition of "Feeds and Feeding" by Henry and Morrison, page 277:

BRITISH PRACTICE

In Great Britain, where many of the farmers are long-period tenants, the manurial value of feeding stuffs is recognized by law in a manner that tends greatly to the betterment and permanence of her agriculture. The Agricultural Holdings Act, which is the law governing the relations between landlord and tenant, directs that when a tenant is vacating his leasehold he shall be reasonably compensated for the improvements he has made. Among these, credit must be given for the fertilizing value of feeding stuffs which the tenant may have purchased and fed out, and also, under certain conditions, for the fertilizing value of grains produced on the farm and fed to stock. In order to furnish data to guide the valuers who serve in settlement between landlord and tenant, after full and extended study, Lawes, Gilbert and later Voelcker and Hall of the Rothamsted Experiment Station drew up the tables showing the compensation to be allowed for the fertilizing value of various feeds. The recommendations, as revised in 1913 and adopted by the Central Association of Agriculture and Tenant Right Valuers, are that the tenant shall be credited as follows for all manure resulting from feeding purchased feeds to stock on the leasehold:

For all unused manure, or that which has recently been applied to the land without a crop being grown thereafter, a credit of three-fourths of the total value of the phosphoric acid and potash in the feed is allowed. Because a greater loss of nitrogen commonly occurs in stored manure than a manure dropped in the fields by animals at pasture, a credit of 70 per cent of the total value of the nitrogen is allowed when the stock have been fed at pasture, and of only 50 per cent when they have been fed in barn or yard.

When one crop has been grown since the application of the manure, a part of the fertility thereby being used up, the credit allowed is only half that stated above. It is realized that the beneficial effects of farm manure persist much longer than two years, but owing to the difficulties in checking records for a longer period, the compensation is not extended over a great time.

The principles of the English law, as here set forth, should be drafted into every lease drawn between landlord and tenant in this country.

All men know how conservative are statements of law, yet here it is seen that the percentages written into English law are 50 per cent of the nitrogen and 75 per cent of the phosphoric acid and potash in the feed. We have not had to think of these things in this country, but the sooner we begin to think of them and practice them, the sooner will come a permanent system of agriculture.

Deducting the manurial value from the first cost we have the net cost per ton in column 1 of Table III. Column 2 gives the net cost of one pound of total digestible nutrients obtained by dividing the net cost per ton by the pounds of total digestible nutrients in each ton. The order of the feeds is changed to compare with the order in Table I.

TABLE III

Feed	Net cost of 1 ton	Net cost of lb. of total dig. nutrient
Cottonseed meal	\$9 31	\$.0060
Distillers' dried grains.....	18 92	.0106
Gluten feed	18 33	.0114
Oil meal	19 52	.0125
Wheat bran	16 45	.0135
Hominy	25 11	.0148
Corn meal	26 22	.0156
Barley	26 84	.0169
Ground oats	31 13	.0222

This table throws all the high protein feeds to the head of the list. The amount of the fertilizing constituents saved may be estimated at a much lower figure, and still the relative value of the protein feeds will be the lowest of any. Too much stress

cannot be laid on this point. The position of the feeds in the list may change from time to time, but there will always be some high protein among those relatively the cheapest on the basis of relative values alone, and surely if the manurial values are given any consideration. This discussion again brings out sharply the need for conserving the liquid manure, for the manurial values arise principally from the value of the nitrogen and therefore the protein.

It might seem that the views of the writer are somewhat in opposition to the views of Dr. Jordan in the first section of this paper. A careful study of both parts will show that this is not true. The writer has merely amplified the first point of Dr. Jordan's — that the feed should be purchased not for the protein principally, but for the total digestible nutrients. The writer has simply tried to show that some of the high protein feeds are usually among the four or five feeds in every list that will give total digestible material the cheapest.

Finally, in the opinion of the writer, high protein feeds are likely to be the cheapest to buy to supplement home grown grains. If all concentrates are purchased, probably at least one-half should be high protein feeds.

SUGGESTIONS FOR BROADENING AND MAKING MORE EFFECTIVE THE WORK OF COW TESTING ASSOCIATIONS

EDWARD VAN ALSTYNE

The value of the cow testing association as a whole needs no argument before this body. It is equally true that these associations have not as yet attained the degree of perfection that their friends would desire, nor are they a "sovereign balm for every wound" of the dairyman. If we start from this standpoint, realizing our shortcomings, we shall accomplish much more for the future usefulness of such associations than were we to pat ourselves on the back saying in effect, "How we apples swim." My purpose is not to say a word as to what has been accomplished, or as to the results as affecting individual dairymen; the place for that is from the platform, cow testing literature, or in a heart to heart canvas with the doubter or skeptic. This body is met to get at facts relating to more effective service; and, having such facts, make them serve the purpose for which they are intended.

I shall indicate some of the weak places as I see them, and suggest remedies. This will avail little unless all of you having to do with the work will be equally frank as to criticism, and not because "it is easy to sit on the fence and criticise, and he who does nothing else is a poltroon and unworthy of attention." Be as ready with suggestions for betterment, and, still more important, willing and anxious to put a shoulder to the wheel and help to make those things effective that receive the approval and endorsement of this gathering.

THE TESTER

I think you will all agree that above all other things the success of an association depends on the tester. As to his qualifications, I should place his moral character and stamina first. We have had some testers who, though apparently well qualified as to their ability to do their work, nearly or wholly wrecked their associations as a result of their personal doings.

After these should come a thorough knowledge of his business. He should not simply know enough to run a Babcock tester, and

have a technical knowledge of feeding, but should have this knowledge from the standpoint of experience, so that his work commends — not condemns — him to the dairyman in whose employ he is. He must be painstaking and accurate. If the books which come to my office to be footed are an indication of the care with which the work is done, some of the men are full of carelessness as an egg is of meat. I am not expecting expert bookkeeping or Spencerian penmanship, but I do look for accuracy, which always can be obtained by care.

Third, the tester should have an ambition beyond simply getting two dollars a day and "found"; he should be a man who believes in the principles of the association, who is ambitious to serve his patrons and make his association effective, and who realizes that only by so doing will he advance himself. There are a few of our testers whom I expect to see occupy a more lucrative and responsible position, and who it would be a pleasure for me to aid because of their faithfulness in that which is least.

Agreeing as to these defects, the practical question before us is how to eliminate them. This, to a large degree, is in our power. First, better training. What this accomplishes is evident by the superior work of those who have had the special training given by Alfred and Morrisville. I urge like work by all our agricultural schools with a selected number of their dairy students. I say "selected," because here should be the first sifting. It is a waste of valuable time expended in attempting to train men who lack the first requisite, moral character; or those who are simply looking for a job, or who are of such a temperament as to antagonize their patrons. So much depends on these testers that we cannot afford to let our good will to the student or applicant overshadow the effect of his failure to make good in an association. The state and the farm bureaus are spending valuable time and funds in organizing these associations, which are not formed for the sake of making a show, but because we believe they are capable of accomplishing material benefit to the dairymen, and therefore to the upbuilding of the industry and those connected with it, in the several counties and in the state. To let these organizations go to pieces for this or any cause, without the most earnest effort in their behalf, is a waste of energy most inexcusable. Not only is the failure of accomplishing the desired end, and the consequent

wasted effort, lamentable, but we must realize that when an enterprise of any kind is started and is then abandoned, it is many times more difficult to start a similar enterprise in that section, and it has also the effect of raising a barrier against advance work of every kind.

Much of the training should be spent in instilling into these young men an appreciation of the qualities which make for success in this particular — as well as in any other — calling. It is surprising what can be done in cultivating the imagination, in giving vision to men, particularly in the formative period. Call this idealism, if you will, but I wish to go on record as saying to you instructors that no matter how thoroughly you may indoctrinate your students with the subject matter of their studies, if you have failed to give them right conceptions of life as a whole, you have not given them the best, and you have lost a splendid opportunity for service.

Next, a more careful examination into the general character and ability of the applicant to fill the particular position. While the perfect man does not exist, it is much better to defer starting an association to which you do not propose to give this super-one whose qualifications are, to say the least, questionable, simply to get going. The last state is worst than the first, as not a few monumental failures plainly testify.

BETTER SUPERVISION

Having done the first and most important work, next comes the matter of supervision. This is well-nigh impossible from the department, and should not be necessary where the associations are in farm bureau counties. I bear testimony from the standpoint of a man who has employed and supervised labor of various sorts for nearly forty years, that the fact of close supervision establishes and maintains high standards of work, by example as well as precept; by kindly criticism, never forgetting, whenever possible, words of encouragement and appreciation. This has always helped to hold a well-intentioned man to his best efforts, and many times has instilled desirable qualifications in one who naturally lacked them. Left alone they drift and deteriorate.

I urge you farm bureau men not to ask for aid in organizing

an association until a good man can be secured, than to start with vision. I realize that this is only one part of your very multitudinous work, but understand that it will be much better for you and the counties which you serve to do a few things well than to attempt so much that you accomplish very little. Do not forget the excuse given in the Prophet's parable "While I was busy here and there, behold he was gone." A case has recently been reported to me of an association which has been dead a month, and the tester gone before the bureau man knew of it. A few herds dropped out, the tester was not able to put in full time, he became discouraged and quit. This is not an isolated case of the loss of associations because of neglect. A little timely looking after would have prevented this. Instead of a lot of wasted time and funds, and a disgusted community, valuable work would still be going on. Take this plain speaking in the spirit I am giving it. You farm bureau men have no better friend, or one more keenly interested in the success of your work — as well as more keenly critical of it — than the speaker. A lack of oversight of one part of your work is an indicator of a similar lack along other lines, and does not enhance your value for the future.

MAGNIFYING THE ORGANIZATION

I have always felt that there was much to be desired in the organization. Usually good men have been selected for officers, but they have not had enough to do, hence they lost interest. People are only actively interested in what occupies them. Recently I was called to meet with an association whose president died more than a year ago, and his place had not yet been filled, nor had they had a meeting in all that time. Well said the wise man — "How shall two walk together except they be agreed," much less twenty-six. The more I have to do with men and things, the more I am impressed with the value of the congregation of men of like purposes. "As iron sharpeneth iron, so a man sharpeneth the face of his friend" — was another true axiom of the wise man.

I would most earnestly urge quarterly or at least semi-annual meetings. I realize that many associations are scattered over a wide range and it is difficult to get the members together at a central point. I also realize that to get them together and give

them nothing worth while is worse than never to bring them together at all. I am sure we can well afford to exert considerable effort in this direction.

I say to you farm bureau men what I wrote more than a year ago to the officers of the associations—that I will be glad to furnish a speaker or instructor for such gatherings. In the discussion at the close of this paper, I shall appreciate an expression from you as to whether it would be best to ask the associations to bear the traveling expenses of such speaker, thereby insuring their interest in what they pay for, or whether such asking would have a discouraging effect. With the assistance and advice of the farm bureau men I feel we can make gatherings of this kind worth while, which I feel they have not always been when simply a speaker was sent from the department. If we could get the patrons to compare notes and discuss among themselves the good and bad features of the associations that would do much to engender an interest. I have suggested that a lunch be provided by the locality where the meeting is held. Nothing has a better effect in making people fraternize than breaking bread together. They might from time to time visit different herds and farms in the territory covered by the association. All these suggestions I want you to discuss.

THE ASSOCIATION A NUCLEUS FOR COOPERATIVE BUYING AND SELLING

Cooperation is in the air. One difficulty with many ardent advocates of the plan is that they have nothing with which to cooperate. Cooperative buying is much easier than cooperative selling. My personal opinion is that nothing would knit the members of an association more closely together than buying their supplies—feed, seed, fertilizers, etc.—cooperatively. This would give the officers something definite to do. I see the handicap of the members living far apart. Would it not be possible in such cases to have two or three branches of the central association? Surely here we have an organization already formed, with its members all furnishing a similar product, and, to a greater or less degree, all working along similar lines. Were I in charge of cooperative work, I should direct my first efforts to working with existing organizations, rather than to starting new and independent ones.

One serious objection to cooperative selling is a lack of the standardization of the products. This is not easy of accomplishment. Might not at least some of these associations be able to do work along this line with their milk, thereby securing both a better article and a better price? It seems to me well worthy of trial.

LOCAL BREEDING ASSOCIATIONS

We already have ample testimony of the work of such associations as they have been established largely through the efforts of you farm bureau men. I consider such in no way inferior to the cow testing associations. I feel that in many cases a cow testing association should also embrace one for community breeding. We have need of many such. I pledge my most hearty assistance to the work of forming and carrying them on. Here again I lay emphasis on the economy and wisdom of working through an existing organization. Nothing would assist in securing to the dairyman a better cow to replace the one his association has shown him to be a bill of expense—and not a source of profit—than better bred stock raised on his own farm. A well-bred bull can be afforded by a number, which on account of price would be prohibitive to most individuals. All of the above would help to knit the members together defensively and offensively.

ENCOURAGING PURE BREEDING

In addition to forming breeding associations as an incentive to better breeding, would it not be worth while to go to the trouble of keeping a separate milk and fat record of all pure-bred cows, and publishing the records of those which reached the standards of advanced registry required by the different breeders associations; also a record of all pure-bred sires, and, whenever possible, the production of their dams and grand-dams. This would be a sort of honor roll and independent advanced registry work leading to the real thing. At least two cattle associations—the Jersey and Ayrshire—have taken steps to have advanced registry records made through cow testing associations, authenticated by the heads of the secondary schools of agriculture. Certainly this will be of material assistance to individual dairymen, and will tend to enlarge the scope and magnify the cow testing associations. It should have our support.

PUBLICITY

There is nothing like printer's ink to insure publicity. A thing which is in the public eye is always appreciated. To this end testers and officials, and particularly farm bureau men, are urged to use the local press to publish the doings of their associations and records of large producing cows and dairies. Personally I see no objection to publishing names as inducing a healthy rivalry. All this would tend to magnify the association in the eyes of its members as well as in the public eye.

Mr. Nicoll suggests the summarizing of data so as to give the total production and cost of production of each association in the state, as we have now over twenty-five thousand cows in the different associations; then publishing an annual bulletin showing the above, with a comparison of the work of previous years. I believe the suggestion a good one and I know of no one so capable of doing it as the same A. J. Nicoll. I shall be only too glad to do this if sufficient funds are available at the end of the institute season. Suggestions as to the above will be in order.

CONCLUSIONS

Surely if this or any work is worth doing at all it is worth doing well, and is worthy of our best endeavor. Nothing worth while is attained without effort. That everyone interested in advancing the dairy interests of our state, through our cow testing associations, might assist through counsel and work along well-defined lines, has been my purpose in bringing this subject before you. I invite your cooperation both in the free discussion of the subject and individual effort to carry out and make effectual the results of our conclusions.

MILK STANDARDS IN NEW YORK STATE

GEORGE A. SMITH AND PROFESSOR H. E. ROSS

The question of what should be the standards for market milk, sold as such to the consumer, has been a live one for a great many years. In the early history of the trade, during which time it gradually grew from the one-cow family supply to a supply from which several neighbors were furnished, there was no special demand for regulation of its distribution.

As the outside supply increased, and milk was transported from greater distances and went through more hands before it reached the ultimate consumer, conditions became less satisfactory and complaints of adulteration more frequent. From these complaints arose a realization that some restrictive laws should be passed to protect the urban consumers from the adulteration of the supply furnished them. The determination of quality and the detection of adulteration was at that time much more difficult than now, since the invention of the Babcock test. Then it was the work of a trained chemist and took considerable time, making it necessarily expensive. For that reason the average person did not know much about the quality of the milk furnished him, and it was not an article of family use to any such extent as at the present time.

When it came to passing a law which should state the percentage of butter fat and other solids not fat that should constitute legal milk, there immediately arose a marked difference of opinion as to what that standard should be. The consumer wanted good clean milk of good quality. The producer said that he could not afford to furnish a high grade milk at the price he was receiving. The outcome of all the discussion at that time was that chemists were set at work to find how poor a quality of milk an individual cow would produce under normal conditions. The producer said it would be an injustice to have standards placed so high that some of his cows would produce illegal milk. When an agreement was reached and a law passed it was in the nature of a compromise between the producer and the consumer, and the consumer got the worst of the bargain. The standard

agreed upon at that time was twelve per cent of solids, of which three should be fat. Since that time the solids have been reduced to eleven and one-half per cent, leaving the fat at three per cent.

At the same time a Dairy Commissioner was appointed to see that the law was enforced. The outcome of this law has been that the consumer has not been furnished with milk of a quality very much above the legal limit; but it has largely stopped adulteration with water. At the present time there are a large number of consumers who would like to purchase a higher grade of milk than that ordinarily retailed, but find it difficult to obtain it in most towns. Certified milk with a guaranteed percentage of butter fat is too expensive for the average consumer. In reckoning the money value of various kinds of food which are offered for sale, the net energy which they will produce is the unit which is used to determine their relative economy. In discussing this question of the retailing of raw milk I do not see any reason why the same rule should not be used.

The State Board of Health has established rules for the sale of milk from the standpoint of its healthfulness, dividing it into classes for cleanliness as determined by the inspection of the dairies and the number of bacteria per cubic centimeter. Under these rules the retailer is responsible for the proper branding of his milk according to these different classes.

The object in formulating these rules was to conserve the public health by insuring them a cleaner and better milk, but they do not grade the milk according to its real food value, which depends on the amount of solids present.

Legal milk, under the present law, contains $11\frac{1}{2}$ per cent of solids, of which 3 per cent is fat. One hundred pounds of that milk made into butter, with good methods, would produce three pounds and six ounces of butter. Selling it at thirty cents a pound, and allowing the skim milk to be worth twenty-five cents, we have a total value for the one hundred pounds of milk of one dollar and twenty cents, or two and seven-tenths cents a quart.

One hundred pounds of 4-per-cent milk handled in the same way would give a value of one dollar and sixty cents, or three and four-tenths cents a quart. On the same basis 5 per cent milk would give a value of one dollar and ninety-three cents or four and one-tenth cents a quart. Since the casein increases about

one-half as fast as the fat, there is a gradual increase in the food value of the skim milk as the percentage of fat increases.

Extended experiments in cheese making, covering all kinds of conditions for a long period of time, give results which, when figured on a basis of 37 per cent of moisture in the cheese, show an average yield for 3 per cent milk of eight and fifty-five hundredths pounds of cheese; $3\frac{1}{2}$ per cent, nine and sixty one-hundredths pounds of cheese; 4 per cent, ten and sixty-five hundredths pounds of cheese; $4\frac{1}{2}$ per cent, eleven and seventy one-hundredths pounds of cheese, and 5 per cent, twelve and ninety one-hundredths pounds of cheese.

Giving the cheese a value of fifteen cents a pound, we have practically the same value for one hundred pounds of milk of the different percentages of fat that the butter gave. This agreement would appear to be additional proof that the butterfat is a true basis of value for milk. The sale of these different grades of milk for the same price is an injustice to the consumer, because he does not get nearly so much food value in the low grade milk as he would in the higher grade. It is an injustice to the producer because it costs him more to produce the milk containing the higher percentage of solids.

If the present health rules are for the best interest of the consumer, and I believe they are, then it would seem that there should be an additional law or regulation which would require the percentage of fat to be stated on the label of the can or bottle. This would be a long step in advance to insure the consumer of getting value received for his money.

This plan under which the producer or middleman guarantees the grade of milk that he wishes to sell so that the consumer could depend upon it, would put the business in a much more satisfactory shape. Also, if such a law were in force, it would seem as if the chances of making an arrangement that would be satisfactory from a financial standpoint for both producer and consumer, would also be greatly improved.

THE AGRICULTURAL LAW PERTAINING TO DAIRY PRODUCTS AND
LIVE STOCK

GEORGE L. FLANDERS

For matter presented by Mr. Flanders, see Bulletin 72, Agricultural Law, 1915, accompanying:

Dairy Products, pages 1812 to 1841.

Live Stock, pages 1844-1860.

THE NECESSITY FOR COOPERATION IN AGRICULTURE

PROFESSOR G. N. LAUMAN

It is the custom in business to take an inventory at the end of a financial year. In fact, the value of such a record is so great that many business houses now have perpetual inventories. These are concerned with the stocks and supplies on hand, and are designed to give a complete record of the physical property at regular intervals. Since efficiency and scientific management have become watchwords in business, we are taking stock of other assets hitherto little regarded. We are attempting to judge of our stock of non-material assets. This is not a new procedure which the twentieth century has invented, for, with ever increasing stress, our histories and later our social science has attempted this. They have inventoried the general and specific mental and moral characteristics of man in general, and specific races and nations in particular. Almost everybody at present is doing this very thing; not with the humility enjoined by the Bible, and not with the proper perspective on beams and splinters.

There is no greater nor more important asset in agriculture than the farmers' individuality, which is in considerable degree a result of the conditions of his life. It is sometimes called an elemental character. Certainly in last analysis it is the character above all others that, in ever varying conditions and in all stages of development, is the most valuable to him, his country and mankind in general. Instinctively we imitate, from childhood to death; one race apes another, and, according to some, there can be but one civilization worth while. In all these forces making for uniformity, the farmer stands out in his individuality, both personal and as a class.

In the United States the pioneer days accentuated this individuality born of the soil. The pioneer was the highest type of the individualist of his time. His very lack of contact with men and ideas made him rely upon himself all the more.

With the coming of a changing agriculture tending toward the permanency that follows pioneering, with the revolutionary methods of transportation of materials, and men, and ideas, the

American farmer is face to face with a challenge to his individuality which will either make or break him.

As a producer he may, if he wishes, continue in the ways of old; but as a seller of produce he must either adopt the methods of today or accept the consequences of economic loss. The two elements which have changed our economic methods are the development of large business and the development of the methods of transportation. These again are due to the growth of population and the consequent possibility of making use of inventions and resources, which a small population could not adequately consume. The relation between the producer and consumer, under these conditions, has developed into a more exacting demand for a standardized product, at a time and in such quantities as the consumer wishes it. The result is a considerable number of middlemen and storage agencies unheard of in more primitive days. The development as here sketched is the same in agriculture as in any other line. It is a fallacy leading to very grave error to suppose that the principles of business are not applicable to agriculture, because it differs in so many ways from other lines that it has its own laws of evolution. It cannot be said too often that as a producer the farmer has problems different from other producers; but as a seller of products his problems are identical, in general, with those of sellers of other products.

These problems are quantitative and qualitative. A few producers will be able to seek out a few consumers, but the mass of producers must seek out the consumers in masses. They must have the quantity and quality to meet the combined demands of the consumers. The middleman is, therefore, a natural development in our economic life. Theoretically it is deducible that every middleman could be eliminated — but not the functions of the middleman. When either the producer or the consumer, or both, take over the functions of the middleman, then that terrible personage will cease to exist. That all middlemen are not honest is simply saying that not all businessmen are honest, that not all professors are honest, that not all preachers are honest. If the middlemen are too many and charge too much, the remedy lies in meeting the situation with a better solution of the distribution or marketing problem. That solution, and the only solu-

tion for the average farmer, lies in cooperation. We should, however, have distinctly in mind that cooperation is no panacea for all the ills of marketing the farmers' products, or the products of any other producer; nor will it solve all the problems of the consumer. For example, it will not solve a problem such as that of the producer who lately sent his produce to the Food and Markets Department of the State in New York City. There will always be much human nature, the vagaries of the seasons, and our limited knowledge to contend with.

The further necessity for cooperating for financial gain is founded on the necessities of production. A country or a region entering upon a permanent agriculture is in need of the same elements of production as any other flourishing business, and these include for the farmer long- and short-term credits. It is a fact that in some parts of the country certain select classes of farmers, and individual farmers, are as advantageously situated with reference to the meeting of their financial needs as their neighbors in merchandising or manufacturing. These are individual solutions and may be applied to greater numbers by meeting the conditions these men have met. Our troubles are due primarily to the fact that during our long pioneering stage our banking methods developed for the good of the merchant and manufacturer. There can be no doubt that the problem in agriculture would gradually and naturally solve itself without special interference; and, to be very specific, the money needed by the farmer would be cheaper with time and a permanent, dependable agriculture. If we wish to hasten the solution of this problem and lower the costs we must cooperate and take the matter into our own hands, not waiting for the slower natural evolution. Government aid will be helpful in so far as it gives fundamental and encouraging laws to this end, but it is against all dictates of history and the laws of human nature to expect a permanently satisfactory economic agriculture, able to adjust itself to changing conditions, based on government subsidies.

If the individuality of the American farmer will so far control his actions in the future that he cannot cooperate with his neighbors, then it seems, with the ever increasing evidence that is brought to our attention, that as a seller of produce he must

pay the price of independence, with the resultant smaller returns for what he produces; and, as a producer, if history repeats itself, the inevitable evolution will either make him a renter or the laborer on a large estate. For, if the trend of modern business is economically sound, the farmer can not afford to fight against it nor let it consume him in his individuality.

Doubtless every one here, as he continues to reflect on the present and past of American agriculture, finds more and more evidence that the social life of the pioneer community had its roots deep down in the soil, and scarcely looked beyond the community for any satisfactions in life. As every economic change brings a resultant social change, the compelling fact that these changes are now with us,—that our agriculture is a part of the world's agriculture, that our ideas and ideals of society do not come for the most part from the Bible—means that the roots of our social ideals and organization are no longer primarily in our own community, but that our auto and our daily paper takes us out of our limited world into a perplexing larger world. As an example, consider the problem of religion in the country. The physical fact is apparent in many communities that there are fewer people to go to church, but what is of more importance is the attitude of those who are still in the country. All our struggle with dogma, evolution and inspiration affects the life of the country churches, and will continue to do so until we have completed the transition stage we are now in, and have reached comparatively tranquil waters and a satisfactory philosophy of life.

In last analysis all our social problems are of the same general nature. We have the physical facts, easily gotten at, and our ideals or lack of ideals, to contend with. To me it is just here that the individualism of the American farmer will be either a great force or a great hindrance to the solution of our problems. If the initiative born of individualism is gradually eliminated by subtle forces, we need not expect a satisfactory social life in the rural community. Consider for a moment how local political power and initiative is imperceptibly disappearing from the American rural community. The roads and the schools are controlled in the capitol. Our health is regulated from Albany. Our newspapers come from the city. This is not saying that all this

is wrong; it has much good in it, but it must be understood that the country community is losing by having its daily life regulated from outside sources, rather than developed from its own initiative, guided by its own leaders, though aided when necessary by agencies outside of itself. The value of such a social school is far greater to the rural community than to the urban community where the individualist is lost in the general amalgamation and standardization that such life brings with it.

Our only hope for such a training school is cooperation. Cooperation for every conceivable need of the individual and the community — business, religion, health, recreation, communication.

I look with some misgivings upon the practice of organizing cooperative enterprises, of whatever nature, as large organizations. The more nearly home such an organization can be brought, the greater will be the good it accomplishes. A local community in which all the members know each other is the ideal unit for such agencies. We may go still further and say that to begin cooperation, especially for business purposes, with a few neighbors, is the ultimate ideal, for the training in cooperation is not fundamental unless the individual is in close and constant touch with the problems as they arise. We need a sound body of co-operators in small groups, whose representatives will really represent in the larger bodies which are the natural outgrowth of flourishing cooperation. Some sections of our land have lately developed much local cooperation, which in many cases is not legally organized, but which nevertheless serves the needs of the occasion and prepares for more permanent types of cooperative bodies. It starts wrong when cooperation is founded on the county unit and not on the smaller local unit.

MAKING THE WOODLOT COUNT

PROFESSOR RALPH S. HOSMER

The question of how to make the best use of his woodlot is one that faces every farmer, and hence, indirectly, every agricultural instructor and farm bureau manager. At first blush it may seem a different problem to make the woodlot a real asset to the farm. Certainly the prevalent and time-honored way of letting it grow up haphazard, and of cutting from it whatever may at the moment be needed, is not the most efficient method of handling this kind of farm property. But, like many another, when the problem comes to be analyzed, it is found that its difficulties are not so serious as they seemed at the outset and that rightly managed the woodlot can be made as tangible and definite an asset as any on the farm.

The wise use of the woodlot is essentially a matter of land classification and of the application of business principles to a business proposition. When to these are added a due consideration of the rules of efficiency and a liberal share of common sense, the trick is turned.

AREAS ADAPTED TO FOREST

On every farm there is almost sure to be some land on which it is not profitable to grow crops. Certain areas are too poor or too steep even for scant pasture. But such land will grow trees, and here is one great advantage of the forest crop. It will grow where other crops will not; first, because trees do not make such heavy demands on the soil for fertility, and second, because trees will grow on slopes too steep to permit of tillage. Another advantage which the forest crop has over other crops comes from the very fact that it takes longer to mature. Trees are not so seriously affected by unfavorable seasons because in the long run the ill effects of drought or storm are offset by the years when growth is vigorous and rapid.

It is no part of the argument of the forester to urge that all land should be devoted to growing trees. Rather does he suggest that forest growth, especially on the farm, be restricted to those areas which will not grow other crops to advantage. In other

words, he recommends that the land area of every farm be so classified that each portion shall be used for the crop to which it is best adapted. It would be folly to use for forest the meadow land, or the rich fields that yield good crops of corn, or wheat, or potatoes. But it is equally fallacious to waste time and labor in trying to grow these crops on land that is adapted only for forest. It does not require much figuring to compare the returns that may be got from pasturage as against wood production. If the balance swings toward the latter, the indications are that the area in question is forest land, and that the right crop for that section is trees; for trees — that is, forest — are as much a crop as is corn. A forest, to be sure, is slower in coming to the time of harvest, but it yields in the end definite and absolute values.

ADVANTAGES OF THE FARM WOODLOT

The farm woodlot serves its owner in four ways: it yields a salable commodity; it supplies local farm needs in the way of posts, fuel and lumber; it provides opportunity to keep labor employed in winter; and it increases the sale value of the farm, or at least its negotiability.

The argument that it takes so long to grow a forest that it can be of no account to the man who plants it, fails from the fact that the prospective value of a half grown forest is now so well recognized that the owner can realize on it in the same way that he can on a half grown animal.

To obtain good returns from a forest it must be properly handled. It is not enough to leave it to nature. Nature is an admirable servant but a poor steward. Her ideals are not at all man's ideals. She has ample time to work her ways, but her aim is not, as is man's, to develop the largest possible number of certain kinds of trees, particularly adapted for certain definite human ends. It follows that if one is to gain the desirable goal of wise use he must make nature work for him and with him. In other words, he must manage his forest — which is to say, practice forestry.

CARE OF THE WOODLOT

Forestry as regards the farm woodlot, then, means the right care of the forest, its protection, and finally its proper utilization.

The right care of the forest implies such operations as cleaning the stand by removing undesirable individual trees and those of commercially worthless species; making thinnings at five- or ten-year intervals in young stands, so that the best shaped and most vigorous individuals shall have the advantage, thus enabling them to make faster and better growth; and leaving seed trees, or otherwise regulating the final cut, so that the forest may be perpetuated and other and better crops follow in their appointed season.

Protection of the forest covers not only guarding against fire — the arch enemy of all woodland — but also, so far as is practicable, protecting against insect and fungous enemies, and other forms of injury that can be controlled. To be protected the forest does not have to be locked up against use. On the contrary, the forester's ideal is the perpetuation of the forest through wise use. This is the keynote of all of forest work — use plus continuity of supply.

UTILIZATION

The third division of proper forest management, utilization, is essentially the business aspect of the case. To sell any product one must first know what he has on hand; next, he must understand how to get his product to a market; and third, he must know how to sell it, that is, what it is worth and who wants it. Probably there are as many woodlot owners who have an exaggerated idea of the value of their growing timber as there are those who under-value what they have. The latter are apt to suffer at the hands of those who know just what they want and what it will bring. The former often lose good chances to sell through holding on at a figure which is not justified by the demand. Both classes need to improve their business methods. They both need to learn where and who the buyers are who will pay fair prices, or to see if there are not special markets where the demand is for particular sizes, grades or kinds of timber. This knowledge is as much a part of proper woodlot management as is an understanding of the best, easiest and cheapest way of getting the logs from the woods to the mill.

All this is but the application of business common sense. But unfortunately one does not have to go far in any neighborhood, in

any of our Eastern states, to find plenty of examples clearly illustrative of how *not* to do it, in the care and management of woodlots.

Right here is where the farm instructors can help to better things. You are all busy men. Your interests for the most part lie in other directions than forestry; but essentially you are men who appreciate the fact that agriculture is a business in all its branches, and that to succeed in it one must use the methods of business efficiency. The problem is, how to make this point of view sufficiently clear to your constituents so that they will be aroused to feel that the ways you point out are the ways for them to adopt and put into practice.

The seed is taking root. The past score of years have witnessed marvelous strides in the application of the principles of efficiency in the business of the farm. But in most farm woodlots, not to speak of more extensive forest tracts, there is still ample room for improvement. One of the accomplishments of the next decade must be such a bettering of conditions.

EDUCATION AND COOPERATION

What are the means? Education and cooperation. Some of the way it is a newly blazed trail, but it is one that is not hard to follow. One of the principles of efficiency is to seek and profit by wise counsel. How and where is the woodland owner to get such advice? From the state forest officials, from the foresters connected with the agricultural experiment stations and from the extension men and other members of the staffs of the forest schools. One of the ways that the farm bureau managers can help in the good cause is to see that their clients get advice, and then to encourage them in putting the recommendations of the experts into practice.

Usually the cost of seeking counsel of this sort is very small — a proportionate part of the expenses for traveling and subsistence that the agent sent has to incur. If several farms are visited in one section the bill to the individual amounts to very little; and much advice is given free. Furthermore, often all that is needed can be told the applicant in a letter. There are few investments that yield so large and so prompt returns as do the expenditures made in seeking the advice of agricultural experts.

The institute workers and farm bureau managers can help in this matter, then, by getting the farmers and owners of woodland in touch with the foresters. But there is also another and perhaps equally, if not more important way,—through lending a hand to those who are trying to find a solution to a part of the problem through cooperative marketing. Where a farmer has only a small woodlot he can hardly expect to secure from a buyer the favorable terms that are granted the large operator. But if all the farmers in a given locality pool their issues, they should have good reason to expect better prices.

Suppose, for example, that five or six men on adjacent farms each have a woodlot containing merchantable white ash. Individually the output is small. Together there are enough logs to interest a responsible buyer, if he can get them delivered where he can use them. Cooperative marketing is slowly coming to pass with other crops. Why should it not be extended to forest products as well?

It will not come in a day or a year. There are doubtless many other farm products that will take precedence over the timber crop, but that should not blind us to the fact that cooperation is the logical and efficient method to follow, nor dishearten us if our first efforts seem to yield but meager results.

The first point for cooperation is for the farm bureau managers and the foresters to get together and work out a plan; then, if it seems good to the farm bureau men—as I believe it will—to pass the word along to the timber producer. It is not to be expected, nor is it necessary, that the farm bureau managers should become foresters, but if you gentlemen become interested, all of us can work together, and in the end the outcome will be tangible results.

New York State has good reason to be proud of her farms. The time is coming when the same may be said of her woodlands and her farm forests.

REFORESTATION OF HILLS AND FARMED-OUT LANDS

B. H. PAUL

This topic contains two ideas, namely, the reforesting of denuded hill lands, which have never been used for agricultural purposes, and the reforesting of lands which have been farmed until they will no longer produce agricultural crops. For the purpose of this discussion, let us consider these two ideas under the general head of "Reforesting Non-Agricultural Lands." In this connection let us consider reforesting and the practice of forestry as methods of producing a crop on soils too poor for agriculture, or on lands which, because of the nature of their topography or situation, are unsuited for cultivation or use for agricultural purposes.

The reason for the existence of the so-called farmed-out lands is mainly that the supply of organic materials or humus of the soil has become entirely exhausted as a result of continuous cropping and insufficient fertilizing of the soil. These lands were once covered with a forest growth, which for many years kept the soil well supplied with humus by dropping a layer of leaves each year. These leaves slowly decomposed and became mixed with the upper layers of soil, adding fertility and providing a spongy forest floor capable of absorbing and holding large quantities of water. After the removal of the forest cover, the leaves remaining on the surface of the ground were either dried up and blown away by the wind or were burned by fires used in clearing the land. The organic matter remaining in the soil was soon used up by continuous cropping, or else washed down the slopes by heavy rains. Such soils now contain little available organic material and the cost of restoring them to their original fertility by artificial methods is so great that in most cases it is entirely unprofitable to do so. The only practical remedy remaining in such cases is the reforesting of the land and letting nature once more restore the fertility of the soil by a slow but certain process.

The benefit of a forest cover in building up worn-out soils is well worth consideration. Other reasons for reforesting include protection of soil from erosion; conservation of moisture in the

soils; regulation of the run-off of water in the streams, thus preventing floods; furnishing protection for wild game; affording parks and pleasure grounds for recreation, and adding to the natural beauty of the scenery. However, the principal reason for reforestation, from a forestry standpoint, is the production of a crop of timber. Reforestation for the production of timber is of general value to the community, the state and the nation by increasing the present timber supply, and thus fostering the industries dependent upon wood production for their raw materials. However, the person who actually does the work of reforestation is not so much interested in these general benefits derived by the community as a whole, as in the actual revenue which he is to receive from his crop of timber. The consideration of a timber crop brings us to the economic side of reforestation, which we will consider briefly in order to show by whom reforestation may be done with the greatest advantage, financially.

The cost of establishing a forest plantation ranges from \$7 to \$10 per acre. For one plantation of 381 acres, planted in the spring of 1915, the cost amounted to \$6.25 per acre for the planting alone. To this amount must be added the cost of the trees, which in this case ranged from \$2 to \$4 per acre. Figures now available show that for average conditions of soil, climate and marketing facilities, a plantation of white pine will yield from 5 to 6 per cent compound interest on the initial investment of \$9 per acre, including the cost of protection and taxes for a period of 40 or 50 years.*

At present there is a growing tendency toward giving land containing immature stands of valuable tree species of either natural or planted trees, an increased value because of the presence of this immature timber. The courts have rendered decisions in cases where plantations of forest trees have been destroyed by fire, requiring payment for damage sufficient to cover the cost of establishing the plantation and its maintenance until the time it was destroyed. Immature stands of native white pine in the New England States are being purchased and held, awaiting their development into merchantable timber.

* Bulletin 13, New Series, U. S. Department of Agriculture.

Mr. E. C. Hirst, State Forester of New Hampshire writes as follows:

I have in mind one tract of land that sold for \$16 per acre. The bare land would probably have been worth from \$6 to \$8, but there was a growth of pines on the ground all the way from small seedlings to saplings 20 feet high, and this is what made the extra value.

Mr. B. H. Chandler, Assistant State Forester of Vermont, in a recent letter states:

In buying land for the state we always take into consideration the young growth in making up our estimate of land value. I consider a fully stocked reproduction of valuable fast growing species on I or II quality soil worth about \$10 per acre in addition to the value of the land.

Mr. E. E. Carter, Acting Assistant Forester of the United States Department of Forestry, Washington, D. C., gives us the following information:

I know of a number of cases in southern Maine where land bearing young rapidly growing stands of pine, containing some merchantable trees but mostly too small to cut even in a portable sawmill operation, have been sold at values distinctly above the usual price of bare pasture or brush land in the vicinity. I personally tried to buy a small tract covered with a volunteer growth of pine from 5 to 30 years of age at the "going" price of pasture land, but the owner, although in straitened financial circumstances, refused to sell at that price, stating that he considered that the stand of pine doubled the value of the area in question, although the value of the merchantable trees at the local stumpage rate would not have increased the land value more than 25 per cent.

The timber supply throughout this state is fast becoming exhausted. As the above examples indicate, land owners are beginning to realize the value of a young stand of thrifty growing timber. The farm woodlot should no longer be considered as merely a source of supply for fuel and timber as long as it lasts, but rather it should be treated as a special crop yielding a yearly income indefinitely.

Nearly every farm contains some unproductive land on which the owner pays taxes at the same rate as on the remainder of his farm, but gets no returns. These unproductive areas could be fenced and reforested, since very steep land, or rocky, stony land, affords but very inferior pasture, while, if planted to forest trees, it could be classified under Section 16 or 89 of the Laws of 1912, and the assessment reduced to the actual value of the land alone; or the exemption from taxes may be had for a period of 35 years. The initial expense of reforesting such land by farmers can be kept very low, since in many cases the farmer can utilize labor

in tree planting when otherwise it would be idle. Fall planting is especially advantageous to the farmer. In making plantations, he should consider what kind of trees will be most useful to him. If he requires fence posts, he may plant black locust, which will attain a size sufficient for this use in about fifteen years. If he is already plentifully supplied with timber of this character, then he may plant a valuable timber species which will increase the sale value of the land, even though it is not yet matured at the time he wishes to sell.

The extent of forest planting by farmers in this state may be seen from the following figures: Out of a total of 15,000 acres reforested with trees sold by the Conservation Commission since 1909, 9,000 acres, or 3/5 of this area, have been planted by farmers. A classification of purchasers and the number of acres reforested by them as follows:

Municipalities, 3,300.

Private corporations, 1,900.

Wealthy land owners in the Adirondacks, 975.

Schools, 600.

Railroads, 150.

Farmers and all others purchasing trees, 9,600.

In discussing tree planting by farmers, we must divide the farmers into two classes: 1. The farmer who is out of debt. 2. The farmer whose farm is mortgaged. The census of 1910 gives us the following figures: there are 166,674 farms in New York State operated by owners; of this number, 72,311, or 43 per cent, are mortgaged — 43 per cent of the farmers are paying interest at the rate of 5 or 6 per cent on a portion of their capital.

For the farmers who are in debt only moderate investments in tree planting are to be recommended. These could be confined to the planting of trees for fence posts or other small sized timber products which will mature within a few years; or, when it is possible to start a plantation by utilizing labor otherwise unemployed, the initial cost of establishing a plantation of valuable timber species may be kept low enough to make such an investment profitable on account of the increased value which it will give to the land.

For the farmers who are not in debt, a forest plantation provides a safe investment for his capital, provides employment for men when they may be otherwise unemployed, and at the same time adds to the beauty and value of his farm.

In many parts of this state, outside of the Adirondacks and Catskill Parks, extensive areas requiring reforestation, and large areas of forests which are in a dilapidated condition, are to be found. Such reforestation or forestry projects are too large to be undertaken by individuals, since a long period is required for their development. These areas, however, furnish excellent opportunities for investment by corporations or organizations which will endure for a long period of time.

At the beginning it was stated that forests are of general benefit to the community, not entirely from the point of timber production, but also by protecting the hillsides, preventing erosion, building up the fertility of the soil, regulating the run-off of water in the streams, and adding to the natural beauty of the scenery. If this is true and the forests are beneficial to the whole community, is there any reason why the more extensive forests should not be owned and administered by the community for its own benefit?

This statement brings us directly to the consideration of a law passed by the New York State Legislature which provides for the acquisition and administration of tracts of forest land by towns, counties and villages (Chapter 74 of the Laws of 1912). Up to the present time none of the counties of this state have taken advantage of this law. Work in reforestation is being carried on by twenty cities and villages in connection with the protection of their water supply. We have yet to develop a real communal forest managed under scientific principles for the purpose of timber production.

Section 72-a, Chapter 74 of the Laws of 1912, entitled "Acquisition and Development of Forest Lands," provides for the following:

The governing board of a county, town or village may severally acquire for such county, town or village, by purchase, gift, lease or condemnation, and hold as the property of such municipality, tracts of land having forests or tree growth thereon, or suitable for the growth of trees, and may appropriate therefor the necessary moneys of the county, town or village for which the lands are acquired. Such lands shall be under the management and control of such board and shall be developed and used for the planting and rearing of trees thereon and for the cultivation thereof according to the principles of scientific forestry, for the benefit and advantage of the county, town or village.

The amount of non-agricultural land in the different counties of New York State, not including counties situated within the Adirondack and Catskill Parks, is as follows:

There are twenty counties which contain between 5,000 and 20,000 acres of land needing reforestation. There are twelve counties which contain between 20,000 and 50,000 acres of land needing reforestation. There are twelve counties which contain between 50,000 and 100,000 acres of land needing reforestation.

This gives us a total of 44 counties, each of which contains sufficient land needing reforestation for a county forest. What reason is there why counties or towns should not acquire the areas of denuded land and devastated forests within their limits under the provisions of Section 74 of the Laws of 1912 and administer them as county forests? Such lands administered under proper forestry methods would yield a very satisfactory revenue which could be used in paying the expenses of the county or town.

Woodlands, from which the larger timber trees have been removed in lumbering operations, may be secured at relatively low prices. Such woodlands may be developed by removing poor tree species and favoring the young growth of valuable tree species. Open spaces in such forests may be planted. Such forests would yield considerable revenue from the sale of wood removed by improving the stand.

The county or town holding forest lands would not be taxed upon them. Village forests outside of the corporate limits of the village would be subject to taxation in the town in which they are located, unless classified under one of the forest taxation laws of this state. In the administration of the county or town forest, inmates of county institutions could be used to furnish labor. Such labor would cost the county practically nothing, since otherwise many of these inmates would be unemployed and would be an expense to the county.

In conclusion should like to emphasize the fact that small areas of non-agricultural land included in farms ought to be reforested by the farmers owning them if these farmers are in a financial position to do so. More extensive tracts of land which are remotely situated where they may be easily separated from farm lands — for example, hilltops and other extensive areas of non-agricultural land — may be administered to better advantage

by a permanent organization, such as a county, town, village or private corporation. One of the greatest benefits to be derived from a communal forest is the direct effect which it will have in bringing the subject of forestry before all the people. Forests are either directly or indirectly a benefit to all the people, and they should know it. A campaign for county forests is well worth while for the sake of its educational value, since it will first be necessary to convince the people of the necessity for caring for our forests on a large scale before they will become sufficiently interested to establish a communal forest. Timber production requires an investment for a long period of time, and for this reason does not attract private capital. Counties, towns, villages and some private corporations are organizations which will last indefinitely, and they are therefore in a position to acquire and administer forest lands most profitably.

THE ECONOMIC SIDE OF NEW YORK STATE WOODLANDS

DEAN HUGH P. BAKER

When Director van Alstyne asked me to speak to you upon "The Economic Side of New York State Woodlands," in your seventeenth annual gathering, I appreciated the opportunity of meeting you here in the State College of Agriculture in a discussion of this kind. Getting together on such questions as this is the basis of cooperation, and cooperation looms large before us in this country today. In a second letter received from Director van Alstyne he referred to the fact that my talk would be limited to twenty minutes. It was rather a staggering suggestion, because anything I might say on this question in twenty or thirty minutes is in reality merely an introduction to a discussion of the economic problems involved in the handling of New York State woodlands. But I am greatly pleased that you men and women who are meeting the farmers of the state should be interested in the farm woodlot, and, through the woodlot, in the larger questions of New York woodlots and forests.

To some of you, at least, I have expressed before this the attitude of the College of Forestry toward forests and forestry in New York. The institution which I represent stands for a definite purpose, a definite thing in forestry in the state, just as this great College of Agriculture stands for definite lines of work in agriculture. Economists tell us that the source of all wealth is the soil, and any state that will prosper must consider very fully the complete utilization of its soil. I mean not only the soil which may be under the plow at the present time, but all of the soils. The soils of New York which are being farmed at the present time yield, according to statistics put out by the U. S. Bureau of Census, about two hundred million dollars annually. This is not enough from the soils of this state. The educational work of your organization and that of the College of Agriculture, the Geneva Experiment Station, and other agencies, has brought about great increases in the annual returns from farm lands; but we can no longer delay consideration of all lands, all soils, in

the state. I say no longer because I am looking at the whole question of forestry in New York with the startling facts in view that the state of New York has a debt equal to \$47.00 per acre for every acre of land, good and bad; that last year the legislature levied a direct tax of \$18,000,000; that the joint Legislative Committee on Taxation has just reported that the cost of state government in New York, between 1910 and 1914, increased 40 per cent, and they report that there is every indication that it will be necessary to impose each year during the next five years a direct state tax of from \$14,500,000 to \$19,000,000. This tax, it is claimed, will be necessary even if the state succeeds in stopping further increases in cost of government, holding its present expenses to the present amount.

I am also considering this question of the use of our woodlands in the light of the experience of the older countries where in several instances the forest soils of the province or state give a considerable part of the income to the state in which they are located. In referring to the income from our agricultural lands, I assumed that the annual return per acre per year in New York is from \$4.00 to \$6.00. This is not large when one considers the returns which are secured from the German forests. In the Black Forest of Southwestern Germany, a region very much like our Adirondacks, a return of from \$2.00 to \$4.00 per acre per year is being secured. In one section near Baden I was amazed to find owners of tenant farms turning their tenants away from the farm, tearing down the farm buildings and planting Norway Spruce. In little Saxony as high as \$6.00 per acre per year is being received from forest lands. True, economic conditions over there are quite different from ours; yet in the expense of our government per capita our economic conditions are not so different. If we are to be relieved from our increasingly heavy state debt and direct taxation, we must consider sensibly and with vision every phase of the full use of the soils of our great state.

You people who are interested especially in agriculture have 300 years of practice, good and bad, back of you in this country. Those of us who are working in forestry have but a decade or two, and this not so much in practice as in determined efforts in the education of the people. After this long agricultural history, New

York, according to the statistics of the nation and the state, shows an area greater than the size of Massachusetts, Connecticut and Rhode Island as idle land. I say idle, because it is not productive. The people of the state have just decided at the polls that New York can afford the luxury of nearly two millions of acres of unproductive land in the Adirondacks and Catskills. I am very sure that those who are opposed to the right use of the forest lands of the Adirondacks and Catskills have not connected up their use with our state debt of \$47.00 per acre, and our direct tax. There is a direct connection, and two things must be considered together in any economic discussion of the problem of New York State woodlands. I speak with knowledge when I say that our woodlots are as a rule idle, because the returns from most of them, according to investigations which the State College of Forestry has been carrying on during the past four years, do not cover interest on capital invested, taxes, etc. That is, in many instances the farmer with unproductive woodland is boarding a part of his land just as much as he boards an unproductive cow.

As a matter of public policy, there is absolutely no question as to the economic advisability and necessity of using our forest soils. I am using the terms "agricultural soils" and "forest soils" in reference to conditions in the state, but unfortunately we have not as yet definite data as to just how much agricultural soil and how much forest soil we have. Every square foot of land that can produce an agricultural crop must be classed as agricultural soil, and the forester is the last man to want to see any soil capable of producing agricultural crops put into forest trees as a crop. The necessity for a thorough stock-taking of the natural resources of the state has constantly been borne in upon the college. Such a knowledge of our natural resources is absolutely necessary before we shall have the accurate knowledge necessary to plan with saneness for the future.

With the changed economic conditions which will result from increased population, there will, of course, come some change in the extent to which we will occupy the soils of the state for agricultural purposes. However, I feel that it is fairly safe to say that if, after 300 years of human activity in New York State, we still have 10,000,000 of idle acres, there is not going to

be great change in use of land during the next fifty years. Here I want to sound a note of warning to those good, enthusiastic people who would see the idle of our cities, or the newcomer from abroad, take up all of our so-called abandoned farms. New York has abandoned farms and possibly it has been with these farms as it is with individuals — a simple following out of the law of the survival of the fittest. Should there not be a better knowledge of the exact value of the soils on abandoned farms before we allow people to occupy them with sure defeat ahead — to repeat the tragedy of the abandoned farm. In the Rural New Yorker for November 6 there is a brief but interesting article upon "Some Deserted Farms in New York," and I quote a part of the last sentence: "A few acres can be purchased here with slender savings and homes established on the basis of hope for future independence and freedom." The forester is just as anxious as anyone to see all true agricultural lands used for agriculture, but let us be fair to the man "with slender savings" and let the organizations working for agricultural uplift in the state protect the man who may be exploited by the real estate agent or the enthusiast who believes that any soil will grow an agricultural crop.

I have emphasized the necessity of knowing just what we have in the way of forest land and agricultural land in the state. When I came to New York early in 1912, I made a very systematic search, through correspondence and otherwise, for data regarding land conditions, and found, of course, a few figures given out by the United States Census Bureau, by the State Conservation Commission, by the State College of Agriculture, and others. I was disappointed to find that these figures were general in character only, and that there was very little definite information which would let us say to a community, a county, or a part of the state, so much of your land is of greater value to you for agricultural purposes, or so much is of greater value for forestry purposes.

Believing that any definite plans for the practice of forestry in New York, or the consideration of it as an economic problem, must be laid upon more definite information, the college began at once a study of forest conditions in several different counties,

during the summer of 1912. Investigations were made in Onondaga, Greene and St. Lawrence counties. These investigations were more or less experimental to determine the best method of carrying on a stock-taking of soil and forest conditions. In the fall of 1913 a single township was selected in Oswego County; every farm was visited and the lands carefully plotted. This was done to determine the cost of studies, and was followed in the summer of 1914 with more accurate studies of the same nature in the counties referred to above, and in Madison and Cattaraugus counties. In the summer of 1915, five men were started in a thorough study of four hill counties in the southern part of the state. Four of these men were advanced forestry students who worked on bicycles, visiting every farm, mapping in the woodlot areas on enlarged geological survey quadrangle sheets, talking to the farmers of the treatment of their woodlots, and also as to the disposal of timber from them. Questions were asked also as to local supplies; that is, what kind of lumber the farmers were using and where it was obtained. It was an amazing thing to find in some townships nearly a half of the township covered with woodlot, and yet the farmers were paying a high price for lumber from the Pacific Coast and from the southern states. The man in charge of this study worked with an automobile, supervising the work of the men on bicycles, and as his part of the study visited retail lumber yards and manufacturing plants to find out what they were using and whether it would be possible for them to use the products of the woodlots. The map of Broome county which I have here with me is in itself a study of the economic side of New York woodlands.

A preliminary report is soon to be published by the college on the hill counties studied last season. Out of these studies there has come the conclusion that the only solution of our woodlot problems, from an economic standpoint, is the development of a market for the products of the woodlot. A study of market conditions in these hill counties forces the conclusion that this can only come through the cooperative efforts of woodlot owners. Already the college has underway two or three different schemes for bringing about the cooperative marketing of woodlots.

As a part of the plan for a study of woodlots, and their relation

from an economic standpoint to the business of the farm and the industries of the counties and state, the college made an investigation in 1912, in cooperation with the United States Forest Service, of the wood-using industries of the state. Two men assigned by the college and two from the United States Forest Service visited a large proportion of the wood-using plants of the state. Those not visited personally were reached with cards, and the report is very accurate for the year 1912. Its accuracy and value, of course, will decrease with passing years. The circulation of this report brought so many inquiries regarding the marketing of forest products that the college established in 1913 a Wood Utilization Service, which is in the Department of Wood Utilization. This service lists the materials which woodlot owners and manufacturers have to sell, and sends these out in the form of a bulletin sheet to some 600 producers and consumers. It is effective for the disposal of lumber and other products which are produced by the single or cooperative efforts of woodlot owners. The college is finding that owners of wood-using plants are very anxious to learn where they can get satisfactory supplies, especially of hardwoods, and they are perfectly ready to buy the products of the woodlot, providing that these products can be put into standard form and delivered in sufficient quantities to make them worth while. Merely getting woodlot owners to have their woodlots cut together is not enough. The cooperative cutting must be followed by finding a market for the products of the cutting. This the college believes can be taken care of as effectively as in any other way by its Wood Utilization Service.

The satisfactory marketing of the products of the woodlots today will mean that the owners will be the first to solve the problem of the up-building and extension of the woodlot; that is, if a farmer finds that by taking care of his woodlot and by doing a little reforestation in the fall or spring, he can turn his product over to the buyer through cooperation with his neighbor. And with such a marketing agency as the college is maintaining, it is not going to be a difficult matter to convince him of the desirability of reforestation and protection. The economics of New York State woodlands are based upon the same fundamental ideas and facts as the economics of agricultural or industrial production —

develop a need for the products of the woodlot and the forest and the woodland owner will meet the need. Protection and reforestation will take care of themselves, in a sense, if the market is assured.

Whatever is accomplished in the forests belonging to the state or in the woodlands of the private owner, must be accomplished as the result of education. This I do not need to tell an organization such as the State Bureau of Farmers' Institutes, which is concerned with the education of the people, nor do I need to point out that the splendid work of the State College of Agriculture is based upon its education of the people. The work before the State College of Forestry, and other agencies working for forestry in the state, is to go out and by practical demonstrations and otherwise to bring our people to see that forestry is a sound business proposition, just as essential for the welfare of the state as any other phase of conservation. Agriculture, which is just as much a part of conservation as forestry, cannot alone solve the problem of the complete utilization of our soils. Neither line of work is subordinate to the other, but if the history of the development of agriculture and forestry in the older countries means anything at all, it means that the two lines of work are coordinate and must work hand in hand in bringing about the best use of the soils, and in up-building the industries of what we believe to be the greatest commonwealth in the Union.

MARKET DISTRIBUTION OF POULTRY PRODUCTS

E. W. BENJAMIN

The work and thought spent on the problem of distributing poultry products from the producers to the consumers has brought us to the point where we are beginning to at least see the surface more clearly, even though it may be said that we can yet hardly see below the surface. A few of the many workers, however, are beginning to see rays of light, and more definite ideas are being developed for the more efficient, more sanitary, and consequently more satisfactory methods of handling these products. The mere fact that the problem of obtaining better markets for the producers and better supplies for the consumers is being agitated, has been an incentive, I believe, to the business associates generally called middlemen. I believe it has been an incentive to these associates to spur themselves on to more efficient work. Much improvement has been realized up to the present time, and it should not be hard for institute speakers to point out cases of this improvement to their audiences.

PRESENT SYSTEMS ARE WELL DEVELOPED

The present routes traversed by market products may be likened to a hard twisted cord which is, of necessity, entwined in a tightly drawn entanglement with the other hard twisted cords of similar nature, by the intricacies arising from competition and the peculiar demands of the producers and the consumers. By close study and shrewd operations, it may be possible to slightly shorten the distance between the producers and the consumers, and still pass through the entanglement of competition. This problem looks very much easier from the outside than it does after the theorist has taken up the work, and actually found himself in the midst of the problem. The producers demand complete freedom of responsibility for the quality of their products, and the satisfaction which it should give to the consumers when it finally reaches them. The consumers, on the other hand, demand all sorts of special service and conveniences, which cannot possibly be provided by the distant producer, and must be

furnished by special tradesmen who have the time to make a study of their demands and extract pay for this work from the consumers themselves. We must realize that the whole system has developed naturally, and has been hardened by time. We must attack the problem cautiously and with good sense, or else we shall undo all the benefits which may be derived from the present system, and we shall have a result which is worse than that which we have at the present time.

Careless attack and the thoughtless installing of theoretical systems of marketing are very common occurrences. We can point to failures of cooperative associations on all sides. We have, also, organizations which are really supported by taxation of many people, or by gifts from a few people. These organizations, in many cases, absolutely need this support in order to keep up their expenses and still compete with the regular tradesmen. In other words, some supposedly beneficial organizations have to receive direct gifts in order to enable them to pay expenses. It is very easy to condemn all presently established methods of distribution, and to accuse all middlemen as the instigators thereof; and rural audiences, as well as audiences of city consumers, are especially susceptible to this sort of talk, often praising the speaker for it. I believe we should be very careful in what we say in this respect. We should recognize what value there is in our present system, realizing that the men engaged in handling the products are human beings, and perhaps as earnestly desire improvement of the system as we do ourselves. We should not line up these middlemen before the eyes of the public as antagonists of better methods. The discussion of market methods opens a great temptation for us to wave our hands and shout, "reform." It seems to me that we should be careful and see that we have left the right impression in the ears of our listeners, and that we have given sound advice for reconstruction.

THE POULTRY PRODUCERS' ASSOCIATIONS

For nearly three years here at the New York State College of Agriculture, we have been trying out the desirability or undesirability of the various principles of preparation, shipment and sale of market poultry products. We have done this through

the medium of a trial cooperative association which we have called "The Poultry Producers' Association of Ithaca." The business of this association has never been interrupted since it was started nearly three years ago. We have tried many different methods of operations: various ways for making payments to the producers; rules for grading the products which the producers bring in; collecting the products from the farms versus requiring the producers to bring the products to the station; definite prices for products versus prices dependent on the market obtained; accepting the producer's word for the quality of the products to be shipped to the consumers versus requiring that everything be inspected and guaranteed by the manager in charge. The Poultry Producers' Association, as we have it developed at the present time is, I believe, the culmination of what we have been able to learn relative to cooperative marketing of poultry products.

The principle of the organization of the Poultry Producers' Association is such that the farmers who are vitally interested in developing an association of this sort bind themselves together, take shares of stock at \$5.00 per share, have their business controlled by a board of representative directors, hire a manager to do the work, and then stand together loyally with faith in the result. There may be times when the results will be unsatisfactory, and some members will become discontented. There will be times when the results are highly satisfactory, and everybody wants to go into the association at once. The members should have all these things explained to them, and they should be prepared for them in advance. The competing middleman has been through all of this, and his training has been such as to prepare him for these crises better, probably, than has the training of the average producer. The hard knots of experience have shown us a good many of these pitfalls, and we are now ready to help communities to develop organizations of this sort, and will endeavor to do this developing sanely.

In the development of the Poultry Producers' Association, as with all other cooperative organizations, much depends upon the character of the representative men who are appointed as members of the board of directors, and much depends upon the man-

ager. We have been through a bitter experience in this regard in one of the branch associations. We believe that this can be avoided by closer supervision of the community during the organization period. The New York State College of Agriculture will do its best to assist in the organization of these associations and to train men for the managership of these associations. In communities where it is thought desirable to develop something of this sort, the matter should be taken up in detail with the college and close cooperation can be expected.

BENEFITS OF COOPERATIVE ORGANIZATION

In comparing and combining the effects of the Poultry Producers' Association and the effects of other similar organizations, we have found that, while organization and cooperation of the farmers may, in some cases, have only a slight direct advantage, in every case which has come under our observation, many, and usually nearly all of the following distinct benefits have been noted:

1. Organization tends to make the farmers feel that they are not alone. There is an opportunity and an incentive to exchange ideas. The discussions dealing with the organization work usually start discussions along other lines, which may be even more highly beneficial than the original discussion. The organization is usually a means of disseminating information, such as is contained in bulletins and circulars, and which might be obtained from lectures or demonstrations.

2. When individuals are thrown together in organizations they seem to develop a certain pride in the products which they are producing, and make special efforts to produce a better quality, or a quality which will be at least as good as the average for the whole membership.

3. Better prices are usually obtained for the products, at least after the organization has been doing business for a reasonable length of time. Better prices are caused by both the improved quality and the standardization of the products. Care should be taken, however, that the members do not depend upon better prices entirely for their loyalty.

4. The prices received by the members should be based upon

the quality of the products furnished by each. This fact is of considerable moral value as it is bound to keep the producer interested in increasing his net profits for his products.

5. The interchange of ideas and accompanying discussions nearly always develop a more intelligent purchasing of supplies, such as feed, fertilizers and machinery. One member's experience with certain purchases will help to guide the others.

6. By proper management, some of the necessary supplies can be purchased in combination so that one large order can be sent to the supply dealer, and reduced prices obtained and more standard quality guaranteed.

7. Other pieces of cooperative work might be carried on in order to secure expert help in mating up the stock; doing the hatching and possibly the brooding; supplying breeders for the community; and inspecting and possibly testing the flocks for health, vigor and productivity.

8. A community which is thoroughly organized usually develops a reputation for certain definite products which it is producing and guaranteeing. Such a reputation gradually becomes the pride of all residents; and, if the work can be continued through the early and often discouraging stages, it will gain the helpful support of everyone.

QUALITY OF PRODUCTS SHOULD BE IMPROVED

If anyone has been in the large markets and noted the quality of the eggs which are being received direct from the farmers, they will be shocked at the apparent willful neglect on the part of the farmer to produce even reasonably decent food stuff. Eggs containing large percentages of absolutely rotten ones are shipped from New York State farmers into the New York market. Such cases have been seen by the writer. Until the farmers can be brought to realize their responsibility in taking care of the eggs and poultry, and assuming responsibility for the quality of these eggs and poultry until they are accepted by the customers, they cannot expect any increase in the price which they receive. A large part of the high cost of living for the consumers is due to the loss in the quality of the products while they are on the farm. It is hardly fair to blame the transportation companies and the

middlemen solely, when the farmers themselves are largely to blame.

The farmers should learn how to candle their eggs, and should learn how to handle their poultry. They should be required to handle these products according to certain simple standards. The farmers should be prepared for legislation of this nature as early as possible, by their attention being brought to the present neglect.

SELLING POULTRY PRODUCTS

It is very difficult to recommend one method of selling poultry products to everyone. Personality is an exceedingly strong factor when it comes to representing the quality of eggs which one has to sell, and of satisfying the consumer who receives those eggs. This personal requirement is perhaps the thing which makes it so necessary to have middlemen between the producers and the consumers. Some producers are natural salesmen. These people may safely be encouraged to go beyond the middlemen and reach the retail store, the bakery, the restaurant or hotel, direct. They will be able to meet the complications and difficulties, and will be able to absorb the profit which would be demanded by the middleman without assuming over-balancing expenses. Other producers are just the reverse; they prefer to delve more thoroughly into the problems of production. They do not have the ability to deal with customers. They are successful producers, provided they can dispose of their products with a small amount of trouble and delay, but they would be entirely unsuccessful if they endeavored to eliminate, to any great extent, any of the middlemen in the presently established system of distribution. It is difficult to know just what to recommend to an audience of producers. Each man has his own individual problems. He must use good judgment and common sense in learning whether it will pay him to sell his eggs to his local market or to ship them to a more distant market. It may pay him to sell his poultry alive, or it may pay him to dress it and sell it to a special consuming trade. Ordinarily the farmer, who has less than 500 hens, cannot afford to specialize in his marketing work. Smaller producers especially need to combine with others in the same community, so that together they can act as one large producer, and be

able to have their market work, both buying and selling, done by some one trained for the business.

The improvement of the methods for the market distribution of poultry products depends upon greater individual interest and knowledge. With all the interest and knowledge desirable, however, it would still be impossible for the producer to do very much in improving his own methods for distributing his products, unless he has enough of these products to make it worth while, or else combines with others. Together they can act as a unit which will control enough business. I believe that co-operative organization will be one of the leading factors having to do with the sane improvement of our market methods — co-operative organization among both the producers and the consumers. We should all begin to think along these lines; then, when the time comes for organization in our community, we shall be ready to work.

EXTERNAL INDICATIONS OF EGG PRODUCTION

O. B. KENT

Since those hens that are the most persistent layers — that is, that lay during the most weeks or months — are the best layers, it is comparatively easy, by selecting those pullets that begin to lay fairly early in the fall and lay late the following summer or fall, to cull out the poor producers and grade the birds according to their performance. In a flock that is well cared for most hens will average about five eggs a week while laying. In order to lay 200 eggs, it is necessary for a hen to lay from about December 1 until the first of the following September, or for nine months. If she takes a vacation in the winter, it will of course take longer.

While five eggs a week does not hold true for all hens by any means, yet it is a fair average. Some hens, like Lady Eglantine, will average better than six eggs a week, and keep it up. But what is much more common, some hens will average only two or three eggs a week; yet there is a much greater difference in the length of the laying period of a high and a low producer than there is in the number of eggs laid per week. Realizing this, we want to know how we can most easily and surely recognize those hens that are laying.

Pullets that are laying can readily be distinguished by: (1) a full, bright red comb, showing sexual maturity; (2) a distended abdomen showing that the ovary is full of developing yolks, and that the oviduct is distended; and (3) by the laying out of the color of the ear lobes in yellow-skinned, white ear-lobed varieties. In flocks which are not selected particularly for pure white plumage, the ear lobes of the pullets are yellow before they begin to lay. While a bird is laying, either pigment is drawn from the body to give the yellow color to the yolk, or else a new supply is not forthcoming to the different parts of the body. This results in the bleaching or fading of the yellow color in the ear lobes, beak, shanks and plumage. This fading proceeds in the order just given. As a result, the ear lobes that were yellow before the laying period become white very rapidly after the pullets start to lay. This is the easiest, and in most flocks the most reliable test of

whether a pullet has begun to lay. It is also reliable in picking out the layers during the winter and spring months, but is somewhat uncertain with hens during the summer and fall.

After the first of July the easiest way to pick out the layers is by selecting late moulters. Most hens do not begin to molt until they have stopped laying, but there are some hens that will lay and molt at the same time. This is usually evident by their molting piecemeal; that is, by dropping a feather here and there and then growing one in its place. It is extremely rare for a hen to be free of feathers and laying at the same time.

A hen with a full abdomen and a pliable comb shows that she is in laying condition. A hen with yellow shanks after the first of July and until the last of September has either been a poor layer or else has not laid in some time. The color of the shanks, while fading with egg production, is regained during the molting period or after the hen ceases to lay. This, of course, only applies to birds with yellow shanks, and is influenced by the amount of pigment in the shanks. The more intense the yellow, the slower the color fades out and the quicker the hen regains her color. The yellow color also depends on the feed given. Yellow corn, or lots of grass or other green food, helps to keep up the color.

The question is frequently asked, Do the hens that molt early begin to lay first? So far as our records show there is apparently no relation between the time a bird molts and the time she starts laying after her molt. The late molters molt more rapidly and hence lose less time, which results in greater egg production.

To summarize: In order to pick out the best hens: (1) Select those pullets that start to lay early as compared with the other members of the flock, and market all those that are very late in beginning to lay. (2) Begin culling out hens in July as fast as they stop laying, and market them in order to save on feed and get the benefit of slightly higher prices on market birds. (3) Continue culling until the flock is reduced to the number it is desired to keep over winter. (4) Let this culling apply to all birds regardless of their age, except that the more times a bird survives culling, the more leniently it should be dealt with. If possible, select a small breeding flock of the latest or best layers from which to raise cockerels for the next year's mating; and in this way, help to breed up the flock.

A COMPARISON OF DIGESTIBLE CO-EFFICIENTS FOR CATTLE, SWINE
AND POULTRY AS SUGGESTIVE OF A MORE ACCURATE BASIS
ON WHICH TO COMPUTE POULTRY RATIONS

A. B. DANN

An attempt made two years ago to tabulate and compare the rations recommended by the various experiment stations brought out rather forcibly the fact that we have no uniform basis on which to compute the nutritive ratio and the total nutriment of our poultry rations. It was with the hope that there might be some one basis which we could adopt for the sake of uniformity, if for nothing more, that the present study was made. It represents an attempt to incorporate in one paper all the data on digestibility by poultry that could be found, and to compare this data with similar factors for other animals, in the hope of finding a more accurate basis for study of the nutrients in poultry feeding.

Due to the difficulty of obtaining coefficients of digestion of feeds by poultry, which has resulted in the very meager data now available, we have come to freely use the coefficients for other animals, and, in some cases, the total composition of feeds direct, without considering digestibility at all. To quote from a fairly recent bulletin: "With the present experiments, the nutritive ratio has been considered as the ratio of the protein to the sum of the fat multiplied by 2.3, and the nitrogen-free-extract matter. That is, the digestibility has not been taken into consideration, and the fiber has not been included in these calculations." If I am correctly informed, the station computes the nutritive ratio in all instances from the total composition of the grain, disregarding digestibility entirely.

Most of the stations, however, lacking data for poultry, are using digestible coefficients for cattle. This has been spoken of as the best we have, and on these grounds has been used rather widely, although there is a feeling that the figures for swine would be more accurate. But here again we are little better off than with poultry, for the amount of data available on digestibility by swine is scarcely as voluminous as that for poultry. In an attempt to justify the use of digestible coefficients by cattle,

or to work out some other method that might be more nearly accurate, I wish to present a few tables for comparison. Before doing this, however, I wish to give credit to Prof. J. M. Bartlett or Orono, Maine for the data on "Digestion Experiments with Poultry" as found in Bulletin No. 184 of that station, and also to acknowledge free use of the appendix tables in Prof. W. A. Henry's handbook on "Feeds and Feeding" where the coefficients of digestion for cattle and swine were obtained.

It might be well to state here the apparent accuracy of the methods used, and the apparent reliability of results obtained in experiments to determine the digestibility of feeds by poultry. The method of separating the feces from the urine by a surgical operation to make separate exits for the large intestine and the renal system, has been in use for some time, but for the most part has proved unsuccessful. It is an artificial condition, and as such undoubtedly has considerable influence on the health and activity of the bird, as well as on the physiological processes of digestion, absorption and excretion. The method used at Orono, Me., on which most of the data in this paper are based, was secured by collecting the feces and urine together as normally discharged, and then making chemical analysis to determine the amount of uric acid. This, as representing the urine, was then subtracted from the total, and the balance taken as the feces. By actual test as high as 98 per cent accuracy was secured in these determinations and it would seem that the data thus obtained are quite reliable. At least, it is the best we have and can undoubtedly be used with considerable safety for the purpose of comparison with similar factors for other animals.

In Table No. 1 are compared the percentages of the nutrients in several feeds that are digested respectively by poultry, swine and cattle. Unfortunately, we cannot compare these figures for the entire sixteen feeds which I am able to find as having been used in poultry digestion experiments, for only eight feeds are common to each of the three groups of animals, and one of these, potatoes, is not ordinarily considered as being of great value from a nutritive standpoint.

We are limited, therefore, to the comparison of only seven feeds. Of these I wish particularly to call attention to the one

feed which has been used in digestion experiments most widely, namely, corn. Comparing the percentage of protein that is digested from corn, we find the average from sixteen trials with poultry to be 81.5 per cent; the average from twelve trials with cattle to be 76 per cent; and the one trial with swine to be 69 per cent. Next let us compare the trials with wheat: Protein digested from wheat with ten trials by poultry averaged 75 per cent; with four trials by cattle 74 per cent; and with an unknown number of trials by swine 80 per cent. From these instances it would appear that poultry digest protein more nearly like cattle than like swine.

Comparing the percentage of the nitrogen-free-extract digested from these feeds, we find with corn, poultry 91 per cent; cattle 93 per cent; swine 89 per cent: with wheat, poultry 87 per cent; cattle 93 per cent; swine 83 per cent. In other words, poultry are about midway between swine and cattle in their ability to digest nitrogen-free-extract.

Comparing the percentage of the fat digested from these feeds, we find with corn, poultry 88 per cent; cattle 86 per cent; swine 46 per cent: with wheat, poultry 53 per cent; cattle 71 per cent; swine 70 per cent—a rather wide variation, but the balance in favor of the likeness of poultry to digest fat similar to cattle. And so we might enumerate for other feeds, finding many exception, but nevertheless, as will be shown by the summary of averages, a tendency toward a likeness of poultry to digest more nearly like cattle than like swine.

It is true that the average is not the most conclusive proof, since we want the digestion of individual feeds, but the average of the percentage of nutrients digested by poultry, cattle and swine for the same feeds will at least be comparable, which is the object desired. Three general averages have been taken. First there is given the average percentage of the nutrients digested by each group of animals when all the feeds listed are considered; namely, sixteen different feeds for poultry, representing a total of seventy-four trials; fifteen different feeds for cattle representing a total of one hundred and thirty-one trials; and eleven feeds for swine representing a total of thirty-three trials. This, it must be remembered, is an average from feeds not common to each group,

but it is interesting to note that here again the figures, if indicating anything, show that poultry digest more like cattle than like swine. Thus we have:

Protein.....	{	Poultry	73.6 per cent
		Cattle	72.4 per cent
		Swine	80.4 per cent
N. F. E.....	{	Poultry	79.4 per cent
		Cattle	83.3 per cent
		Swine	87.9 per cent
Fat.....	{	Poultry	72.4 per cent
		Cattle	78.7 per cent
		Swine	67.6 per cent

Now to compare the average percentage of the nutrients digested in the eight feeds common to each group — namely, whole corn, corn meal, wheat, barley, Canada field peas, millet, wheat bran and potatoes — we find:

Protein.....	{	Poultry	72.0 per cent
		Cattle.....	70.2 per cent
		Swine	78.6 per cent
N. F. E.....	{	Poultry	72.3 per cent
		Cattle	87.0 per cent
		Swine	88.3 per cent
Fat.....	{	Poultry	71.3 per cent
		Cattle	75.0 per cent
		Swine	63.1 per cent

This, it is to be remembered, is a comparison where the same feeds are common to each group of animals and undoubtedly more comparable than the above table. We still find our digestive relationship of poultry to cattle holding good, although the variation is rather wide, especially in nitrogen-free-extract. To state the result in figures, we find that when compared to cattle, poultry digest protein in the ratio 100: 97.5, whereas when compared to swine they digest protein in the ratio of 100: 109.2,

or a difference in the ratio 1:6.7 in favor of digestion by cattle. Likewise for nitrogen-free-extract, poultry digest, as compared to cattle, in the ratio 100: 120.3; whereas when compared to swine, they digest n. f. e. in the ratio 100: 122.1, or a difference in the ratio 1: 1.8 in favor again of cattle. Again, in the case of the digestion of fat, poultry digest, as compared to cattle, in the ratio 100. 105.2, whereas when compared to swine they digest in the ratio 100: 88.5, or a difference in the ratio 1: 6.3 in favor again of cattle. It is evident from these figures that the digestion by poultry more closely resembles that by cattle than it does that by swine.

A third method of comparison is made on the basis of seven feeds, potatoes being omitted owing to the fact that they are quite different in character from the dry grains and ground feeds. Taking an average similar to the above, but using only the seven grain feeds common to each group, we find:

Protein.....	{	Poultry	75.66 per cent
		Cattle	73.00 per cent
		Swine	77.86 per cent
N. F. E.....	{	Poultry	82.66 per cent
		Cattle	86.57 per cent
		Swine	87.00 per cent
Fat.....	{	Poultry	71.33 per cent
		Cattle	75.00 per cent
		Swine	63.14 per cent

On the basis of similar computations as presented for the last named group of eight feeds, we find for the digestion of protein a difference in the ratio 1:0.6 in favor of swine; for the digestion of nitrogen-free-extract a difference in the ratio 1:0.6 in favor of cattle; and for the digestion of fat a difference in the ratio 1:6.4 in favor of cattle.

Our correlation is still present though not so marked, and it would seem that if we were to judge from the available data we could only conclude, because the exceptions to the rule are so few, that the coefficient of digestibility for the nutrients in the case of poultry is more nearly like that for cattle than it is like that for swine.

It will be noticed that fiber has been entirely omitted in our comparisons, but since we have considered in all cases the nitrogen-free-extract of the carbohydrates, it would in no way affect the results. We have been dealing with individual nutrients rather than with the digestibility of the feed as a whole. It is very essential to speak of fiber at this time, however, since it is upon this part of the feed that our next comparison will hinge. Cattle are apparently the most efficient animals we have in digesting fiber, and poultry, on the contrary, seem to be the most inefficient (Table I.). To quote a few writers on this subject:

Kalugine (E. S. R. 8, p. 915) — "Poultry digest crude fiber even less than horses or swine, and the crude protein of buckwheat and wheat is digested in an inferior degree."

F. Lehrman concludes that fiber is indigestible by poultry. (Dent. Landw. Presse. 1901 No. 39, p. 341.)

H. Weiske in experimenting with geese concluded that crude fiber is not digested by them. (Landw. Vers. Sta. Bu. 21, p. 411.)

Prof. J. M. Bartlett, Orono, Me., records digestion of fiber only in the case of a few feeds such as cut clover, India wheat, and a small amount in whole oats and wheat bran, and states that poultry digest very little crude fiber. (Me. Bu. 184, p. 327.)

I think we are safe, therefore, in concluding that, if poultry digests fiber at all, it is only to an inferior degree, and that we may disregard it with apparent safety.

In order to reduce our comparisons to simpler terms and to introduce two other bases on which to compute the nutritive ratio of poultry feeds, let us compare the amount of digestible nutrients in one hundred pounds of feed according to five different bases of computation, namely: (1) the total composition of the feed; (2) the nutrients digested by swine; (3) the nutrients digested by cattle; (4) the nutrients digested by cattle, omitting the fiber; (5) the nutrients digested by poultry. The fourth factor is introduced in view of the facts just stated in regard to digestion of fiber by poultry.

These values have been worked out in Table II — the figures representing the amount of nutrient per one hundred pounds of feed. As the table is arranged, all figures are comparable hori-

TABLE I — COMPARATIVE TABLE OF COEFFICIENTS OF DIGESTION

FEED	POULTRY					SWINE					CATTLE				
	Num- ber trials	Crude pro- tein	Fiber	N. F. ex- tract	Fat	Num- ber trials	Crude pro- tein	Fiber	N. F. ex- tract	Fat	Num- ber trials	Crude pro- tein	Fiber	N. F. ex- tract	Fat
Whole corn.....	16	81.58	.....	91.32	88.11	1	69.00	38.0	89.00	46.00	12	76.00	58.0	93.00	86.00
Cracked corn.....	2	72.20	.....	88.10	87.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Corn meal.....	2	74.60	.....	86.00	87.60	.....	88.00	39.0	94.00	80.00	.....	66.00	.....	92.00	91.00
Wheat.....	10	75.05	.....	87.04	83.00	.....	80.00	60.0	83.00	70.00	.....	74.00	.....	93.00	71.00
Barley.....	3	77.32	.....	85.03	67.86	8	76.00	15.0	90.00	65.00	4	70.00	50.0	92.00	89.00
Rye.....	2	66.90	.....	86.70	92.80	.....	.....	.....	.....	.....	2	84.00	.....	92.00	64.00
Oats.....	13	71.31	.....	90.10	87.89	.....	.....	.....	.....	.....	6	77.00	31.0	77.00	80.00
Buckwheat.....	2	59.40	.....	86.99	89.22	.....	.....	.....	.....	.....	2	75.00	24.0	76.00	100.00
India wheat.....	3	75.00	*20.9	83.40	83.80	.....	89.00	78.0	85.00	50.00	.....	83.00	.....	.....	.....
Peas.....	3	87.00	.....	84.80	80.01	1	68.00	33.0	92.00	59.00	2	65.00	26.0	94.00	55.00
Millet.....	2	62.40	.....	98.39	85.71	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hogmy meal.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wheat middlings.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wheat bran.....	3	71.70	*13.5	46.00	37.00	2	73.00	37.0	87.00	71.00	6	77.00	30.0	89.00	92.00
O. P. oil meal.....	.....	.....	.....	.....	.....	4	75.00	34.0	66.00	72.00	11	89.00	41.0	71.00	63.00
Clover.....	3	*70.60	*10.4	14.30	35.50	8	86.00	12.0	85.00	80.00	3	77.00	57.0	78.00	89.00
Beef scrap.....	2	92.60	.....	95.00	86.30	.....	97.00	.....	.....	87.00	.....	.....	.....	.....	.....
Beet (lean meat).....	2	90.20	.....	84.46	72.48	4	84.00	.....	98.00	.....	.....	51.00	.....	90.00	.....
Potatoes.....	6	46.94	.....	79.48	.....	.....	80.45	.....	87.90	67.67	.....	72.47	.....	83.33	78.71
Average of all feeds.....	.....	73.43	.....	72.33	71.33	.....	78.62	.....	88.37	63.14	.....	70.25	.....	87.00	75.00
Average of eight feeds common to each group.....	.....	72.07	.....	82.66	71.33	.....	77.86	.....	87.00	63.14	.....	73.00	.....	86.57	75.00
Average of seven grain feeds common to each group.....	.....	75.66	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Calculated.

zontally, and, if a study of these be made, it will be found that just about 72 per cent of them follow our previous correlation of similarity in digestion by cattle and poultry. But here a new and closer correlation is brought out, which is that between the fiber-free values for cattle and the values for poultry. With just one exception, that of millet, the carbohydrates as digested by cattle, minus the fiber, approach more nearly the carbohydrate value for poultry. In other words, if we eliminate the fiber from the nutrients digested by cattle, we apparently have, as it appears from these data, the most accurate available measure of digestibility by poultry. This is still more clearly shown where the averages for the seven feeds are summarized.

TABLE II.—COMPARISON OF METHODS OF WORKING OUT THE VALUE OF FEEDS FOR POULTRY BASED ON DIGESTIBILITY OF NUTRIENTS

Feed	Nutrients	Total chemical composition per 100 pounds of feed	Nutrients digested by swine per 100 pounds of feed	Nutrients digested by cattle per 100 pounds of feed	Nutrients digested by cattle per 100 pounds of feed Fiber — free	Nutrients digested by poultry per 100 pounds of feed
Whole Corn....	Protein.....	10.3	7.1	7.8	7.8	8.4
	C. H. (N. F. E.)..	70.4	63.5	66.8	65.5	64.3
	Fat.....	5.0	2.3	4.3	4.3	4.4
	T. N.....	91.9	75.8	84.3	83.0	82.6
Corn Meal....	Protein.....	9.2	8.1	6.1	6.1	6.9
	C. H.....	68.7	65.5	64.3	63.2	59.1
	Fat.....	3.8	3.0	3.5	3.5	3.3
	T. N.....	86.5	80.4	78.3	77.2	73.4
Wheat.....	Protein.....	11.9	9.4	8.8	8.8	8.9
	C. H.....	71.9	68.8	67.5	66.9	62.6
	Fat.....	2.1	1.8	1.5	1.5	1.1
	T. N.....	88.5	82.3	79.7	79.1	74.0
Barley.....	Protein.....	12.0	9.1	8.4	8.4	9.3
	C. H.....	68.7	62.5	65.3	63.2	58.5
	Fat.....	1.8	1.2	1.6	1.6	1.2
	T. N.....	84.8	74.3	77.3	75.2	70.5
Peas.....	Protein.....	23.7	21.1	19.7	19.7	20.6
	C. H.....	50.2	48.5	49.3	47.2	44.1
	Fat.....	0.8	0.2	0.4	0.4	0.6
	T. N.....	75.7	70.1	69.9	67.8	66.1
Millet.....	Protein.....	10.9	7.4	7.1	7.1	6.8
	C. H.....	62.6	57.6	48.5	44.4	61.6
	Fat.....	3.5	2.1	2.5	2.5	3.0
	T. N.....	81.4	69.7	61.2	57.1	75.2
Wheat Bran....	Protein.....	15.4	11.6	11.9	11.9	11.0
	C. H.....	53.9	44.1	42.0	38.3	26.0
	Fat.....	4.0	2.9	2.5	2.5	1.5
	T. N.....	78.3	62.2	59.5	55.8	40.4

SUMMARY OF AVERAGES

Per 100 pounds.

Averages of 7 Feeds	Protein	C. H.	Fat	T. N.
Poultry.....	10.27	53.74	2.16	68.87
Cattle (Fiber Free)*.....	9.97	55.53	2.33	70.74
Cattle.....	9.97	57.68	2.33	72.89
Swine.....	10.54	58.64	1.93	73.52
Total chemical composition.....	13.34	63.77	3.0	83.87

* Computed by omitting fiber values.

From this table it would seem that fowls are a little more efficient in digesting protein, and less efficient in digesting carbohydrates and fat, than are cattle. They appear, on the other hand, to be less efficient than swine in digesting protein and carbohydrates, but more efficient in digesting fat. But the point of particular interest lies in the comparison of the total nutrients when computed as an average for the seven feeds for each group. The fiber-free cattle-digested factor 70.74 more closely approaches the corresponding value for poultry 68.87 than does any other factor, and it is this that I wish to leave for your consideration. The difference here is so slight that it might be accounted for by a difference in composition of the grain used, by experimental error in readings or in computations, or by the individual characteristics of the animal. But in any case, the results seem rather consistently comparable; and it is hoped that further investigation may be carried on to check up the accuracy of the method.

I wish to say just a word here as to the reliability of the figures used in these tables. It is interesting to note that according to Henry's "Feeds and Feeding" and Maine Bulletin 184, we have recorded more digestion trials with corn, wheat and oats by poultry than we have by cattle, namely: corn, by cattle 12, by poultry 16; oats, by cattle 6, by poultry 13; wheat, by cattle 4, by poultry 10. Yet we place considerable confidence in Prof. Henry's computations which give us his "Table III."

Another point I wish to make is, that in the event that it were found desirable, upon further investigation, to use for our poultry the fiber-free coefficients for cattle, it is a very easy matter to compute the amount of digested nutrients direct from the appendix tables of Prof. Henry's book. In fact, for my own information, I have already made computations for over one hundred feeds, and find that they appear to check up very well and to look reasonable.

Considering these two points and in view of the fact that it will undoubtedly be a great many years before we will have sufficient data to allow the use of digestible coefficients obtained direct from poultry, and also because we have constant need for working

out nutritive ratios, total nutriment and the like, I am wondering if, for the sake of uniformity alone, we would not be justified in adopting a standard method even though it may not be entirely grounded on good statistical experimental data. If so, what would this system be? The total chemical composition of feeds is undoubtedly the most inaccurate. We have seen, further, that digestion by poultry seems to be more nearly like cattle than it is like swine, and, coupled with this fact, if we agree that fowls do not digest fiber, I offer you the suggestion that we might find it advantageous, at the present time, to use the easily computed method of eliminating the fiber from the digested nutrients as obtained from experiments with cattle, and adopt these values in computing the nutritive ratio and the total nutriment of our poultry rations.

SOME COMMON LEGUMES

F. E. ROBERTSON AND F. C. BARLOW

VETCH

Winter vetch (*Vicia villosa*) for many years grown and highly valued as a cover crop in orchards, has been within the past four or five years quite widely grown as a forage crop in combination with oats and the clovers. It is also being grown with good success with oats as a soiling crop. Being richer in protein than alfalfa its feeding value in this respect should receive consideration. Another point that may be considered in its favor is that its range of growth is greater than alfalfa. It seems to thrive very well indeed on soils that are markedly acid in nature.

The rate and time of seeding winter vetch varies with the purposes for which the crop may be grown:

1. When desired for a forage crop with oats, and to follow this crop in the clover and timothy, use from 6 to 8 pounds of winter vetch seed per acre in addition to the regular seeding of oats, clover and grass seed. Grown in this manner the vetch does not interfere materially with the oat crop harvest.

2. Grown as a soiling crop with oats, use 10 to 12 pounds per acre with the usual, or somewhat heavier, rate of seeding of oats. The aftergrowth of vetch may be pastured or plowed under as a soil improver.

3. When grown for seed, use 25 pounds of winter vetch with one-half bushel of rye or wheat per acre. This crop should be seeded early in order that the vetch may get well established before winter. The method for growing winter vetch seed in New York State is not yet well established.

SWEET CLOVER

The sweet clover crop within the past two years has received considerable notice, but as yet we are not justified in recommending its culture where alfalfa will grow well. Sweet clover seems to thrive well under conditions where alfalfa is not successfully grown, and for this reason the crop may have an important use in certain sections of the state.

The rate of seeding is about the same as with alfalfa. The time of seeding under average farm conditions in New York State is in the spring, and the crop is handled in much the same way as alfalfa when seeded with oats or some other associate crop. Experience seems to indicate that a rather compact seedbed is desirable. Unless the crop is permitted to self seed, or an annual application of seed is sown, a permanent stand of sweet clover cannot be assured, and even with these precautions, we have not yet sufficient experience with the crop to justify saying that it will ever be possible to maintain a good stand of sweet clover comparable to a perennial stand of alfalfa.

Two cuttings of sweet clover may be made the season following seeding. The first crop should be cut early, June 10 to 25, or before the stalks get mature. When the stand of sweet clover is as thick as alfalfa the stalks are not coarse. To insure a second crop to be used as hay or for seed, the first cutting should be made rather high, before blossoming time, otherwise many of the plants will die. Sweet clover is palatable and nourishing and is eaten readily by horses, cattle, sheep and swine after they become accustomed to its rather bitter flavor. Since it has a use as a forage or pasture crop on the farm it is well worth experimenting with to determine its economic range of growth and use.

Generally the white blossomed sweet clover (*Melilotus alba*) is to be preferred to the yellow blossomed (*Melilotus officinalis*) because of its vigorous growth and more abundant foliage.

WHERE NOT TO GROW ALFALFA

Our point of view concerning the range of conditions under which alfalfa will thrive is changing. Formerly alfalfa growing was considered closely restricted to certain soil areas where conditions were peculiarly suitable. Today we find alfalfa growing excellent (profitable) crops on a very wide range of soils. Alfalfa growing should not be discouraged because we do not yet know on what soils it will fail to make a satisfactory growth.

While we recommend that alfalfa growing should not be discouraged, at the same time it is unwise for anyone to attempt to grow alfalfa anywhere before complying with all of the conditions we know successful alfalfa growers advocate. Alfalfa is

too valuable a crop to attempt to grow before supplying the conditions under which alfalfa thrives. Manifestly there are a few conditions under which alfalfa will never thrive — on thin rock-land soil subject to drouth, wet soil where adequate drainage cannot be supplied, and deep sandy soils very deficient in organic matter. Some soils on high elevations with hardpan subsoils, may never be made suitable for alfalfa growing.

Knowing, however, that alfalfa thrives best when certain conditions are satisfactory it would be poor policy to attempt to grow the crop successfully before supplying these conditions.

Always insure the alfalfa crop with:

1. Proper drainage to remove excess water. No economic plant thrives under conditions of excess water.

2. Supply available fertility, if lacking, with farm manures or adequate applications of fertilizers.

3. An abundance of carbonate of lime is most vital. Apply one to two tons per acre even on soils that contain some lime carbonates.

4. Inoculate the soil or the seed, or both, with either (a) soil from fields where alfalfa has been growing successfully, or (b) with bacterial cultures.

5. For New York State seed secured from northern states is preferable to that from the Middle West. Northern grown seed is desirable.

6. The time and method of seeding is also most important. There is a growing tendency to sow alfalfa seed not later than the middle of July, and in some parts of the state earlier seedings are more satisfactory than late seedings.

Thus, by supplying the conditions under which alfalfa thrives, and following the practices advocated by our most successful alfalfa growers, many farmers will learn that alfalfa growing has a much wider range than is now supposed.

THE STANDARDIZATION OF SEED POTATOES

F. C. STEWART

The necessity of fixing some standards for seed potatoes is becoming very evident. Buyers of seed potatoes all over the country are complaining bitterly of the difficulty of obtaining good seed potatoes. The majority of the growers of seed potatoes appear to be utterly ignorant of what constitutes good seed, or else they are without conscientious scruples in the matter. In many cases the only difference between seed potatoes and table stock seems to be in the name and the price asked.

This condition of affairs must be remedied somehow. The present haphazard methods in the seed potato trade work to the disadvantage of nearly all parties concerned excepting, perhaps, a few unscrupulous dealers. Mr. W. A. Orton of the Bureau of Plant Industry has advocated, as a remedy, the organization of a system of inspection and certification of seed potatoes. In Wisconsin, Michigan, Vermont and Maine steps have already been taken in this direction. During the past two years there has been much discussion of the subject in this state. It is to be hoped that some definite action may be taken soon.

In the standardization of seed potatoes three chief things to be considered are: (1) The degree of varietal purity to be required; (2) the amount of the various diseases permissible and, (3) the methods of inspection and certification necessary to insure conformity to the standards adopted. We will briefly consider these in turn.

VARIETAL PURITY

Concerning the standard of varietal purity I will say that it seems to me it should vary somewhat according to circumstances. For example: A mixture of Rural New Yorker No. 2 and Sir Walter Raleigh is difficult to detect; moreover, these two varieties are so similar that it does not matter greatly if they are mixed. On the other hand, there is no excuse for the mixture of a late with an early variety, as, for example, Sir Walter Raleigh or Carman No. 3, with Irish Cobbler — a very frequent combination which is disastrous to the grower of early potatoes.

In other words, a mixture of closely related varieties belonging to the same group is permissible within rather wide limits, but a mixture of varieties belonging to different groups should be permitted only within very narrow limits. No field showing over 15 per cent of varietal mixtures should be accepted for seed even if the owner is willing to rogue it. Fields showing less than 15 per cent mixture of varieties of different groups may be accepted if thoroughly rogued.

DISEASES

The extent to which potatoes may be diseased and yet qualify for seed depends, of course, on the nature of the disease. There must be different standards for different diseases.

The wart, being a dangerous disease not yet established in the United States, should be carefully guarded against. Seed potatoes should be absolutely free from wart.

Just what may be expected of powdery scab is not clear at present. Recent observations indicate that it may be unimportant in the United States except, possibly, in the extreme northern part. However, for the present, it seems best to require that seed potatoes be absolutely free from powdery scab.

Of the common scab it may be said that a small amount of it on seed potatoes is not seriously objectionable, because the germs of the disease are readily destroyed by the corrosive sublimate treatment, which should generally be given to seed potatoes anyway. Of course, no very scabby tubers should be included. I agree with Mr. Sands that a tolerance of 10 per cent slight scab infection should be allowed, provided that of this amount the infections on any one tuber do not cover more than 10 per cent of the surface thereof.

The same may be said of *Rhizoctonia* as of common scab.

Even a severe attack of late blight need not, necessarily, disqualify a field of potatoes for seed purposes. Frequently, little or no rot follows severe attacks of blight. A severe attack of rot, on the other hand, may warrant disqualification. Moreover, when conditions are favorable for rot, shipment from blighted fields for seed purposes should not be permitted for at least a month after digging. The object of this requirement is to give affected tubers a chance to show themselves so that they may be

sorted out. I think that the claim, sometimes made by southern growers, that seed from blighted fields is especially liable to rot after planting, and gives poor stands, is not well founded. Rotting of the seed pieces after planting is usually due to other causes. With reasonable care in sorting the seed at planting time very few blighted tubers need be planted. Neither is there any great danger of starting blight through the use of seed from blighted fields. While outbreaks of blight have sometimes been traced to the use of blighted seed, such cases are rare, and experience goes to show that fields planted with blight-free seed usually blight as early and as severely as those planted with seed from unblighted fields. Blight-free seed has not the advantages often claimed for it; yet potatoes from fields showing much rot can hardly qualify as first-class seed.

Mosaic is a new disease which promises to become a very important factor in the seed potato business in this state. It is transmitted through the seed, yet shows no evidence of its presence in the tubers. There is no means by which affected tubers may be detected. Badly diseased plants are easily detected by their wrinkled, curled foliage and small size; but in mild cases it is often difficult to distinguish diseased plants from healthy ones. This fact makes inspection for mosaic difficult and uncertain. As yet it is uncertain how strict it will be necessary to be in regard to mosaic. With some varieties it is very destructive, and recent experiments at the Geneva Station indicate that, under some conditions at least, tubers from slightly affected plants may produce plants which are entirely worthless. Thus, according to present indications, fields showing much mosaic are to be avoided as a source of seed. However, we are confronted by the fact that mosaic is widespread throughout Maine and northern New York; and, if we are to have enough seed potatoes to supply the demand, we shall be obliged to pass fields containing some mosaic. In view of this, and the difficulty of detecting mild cases of the disease, it is suggested that, for the present, the limit on the amount of mosaic permissible be placed at 5 per cent. No field showing over 15 per cent of mosaic should be passed even though the owner is willing to rogue it, and fields containing a smaller amount than 15 per cent should be rogued down to 5 per cent or less before being accepted.

Leaf roll and curly dwarf are transmitted through the seed and, as with mosaic, affected tubers can not be detected; in growing plants these diseases may be detected quite readily. Fields showing more than 10 per cent of either of these diseases at the beginning should be disqualified for seed. Fields showing less than 10 per cent may be accepted after thorough roguing.

The same rule should apply to fields containing many small, weak plants unaffected by any recognizable disease. The presence of a high percentage of small, weak plants is evidence that the strain is degenerating, and it is unsafe to use for seed even tubers from the large plants in such fields.

Similar limits should be placed upon blackleg. The presence of over 10 per cent of blackleg should disqualify a field. If there is less than 10 per cent the field may be accepted after thorough roguing. It should be borne in mind that the corrosive sublimate treatment of seed tubers is a preventive of blackleg.

The wilt diseases (*Fusarium* and *Verticillium*) and the stem-end browning of tubers require stricter treatment. These diseases are especially dangerous because they are transmitted through the seed, and there is no known method of efficient preventive seed treatment or of eradicating them when once established. Fields showing, previous to roguing, over 2 per cent of plants affected with wilt should be disqualified; and not to exceed 1 per cent of tubers affected with distinct stem-end browning should be permitted at the final inspection.

OTHER CONSIDERATIONS

In addition to the above there should be some regulation regarding the size or weight of tubers. For late varieties I should recommend two to twelve ounces, and for early varieties two to ten ounces as being the proper limits of weight. Also, it should be stipulated that, in fields acceptable for seed, good cultural conditions shall prevail and that the yield shall be a satisfactory one for the variety.

The discussions at the several conferences which have been held over this matter show that it will be very difficult to reach close agreement on seed potato standards until after there has been more experience with the actual work of inspection and certification.

My view is that the standard should not be placed high at first so that it may be gradually raised as our knowledge of the subject grows.

SUMMARY OF STANDARDS

Briefly summarized, the following standards are proposed for New York seed potatoes:

1. Freedom from evident varietal mixture.
2. Conformity to type of variety as regards vine and tuber characters.
3. Freedom from wart and powdery scab.
4. Practical freedom from leaf roll, curly dwarf, blackleg and weak hills.
5. A maximum of 5 per cent of mosaic.
6. Freedom from serious infection with other diseases.
7. Good cultural methods.
8. Tubers to weigh between 2 and 12 ounces for late varieties and between 2 and 10 ounces for early varieties.
9. Satisfactory yield for the variety.

METHODS OF INSPECTION AND CERTIFICATION

While the difficulty of deciding upon standards is considerable, that of working out methods of inspection and certification is greater.

About two years ago when this matter first came up for serious consideration in New York it was thought that the inspection and certification should be done by the state through its Department of Agriculture. Accordingly, the department detailed Mr. H. C. Sands to investigate and draw up the necessary standards and rules and regulations to govern it. Mr. Sands made a thorough study of the problem and outlined a very complete method of procedure. It being found that an act of the legislature was required to give the commissioner of agriculture the necessary authority to carry out the proposed inspection and certification, a bill providing for the state inspection and certification of seed potatoes was introduced into the legislature during the closing days of its last session. This bill failed of passage.

Lately the view has prevailed that it would be unwise to enact such a law until after some experience has been gained through an

unofficial system of inspection and certification. With experience as a guide it will be possible, when a law is finally enacted, to avoid some mistakes which are sure to be made if a state inspection and certification should be established at once.

At its last annual meeting the New York State Potato Association took up the matter and referred it to a committee of three consisting of Mr. F. A. Sirrine, Mr. C. B. Tillson and the writer. This committee has not yet completed its labors and is not prepared to make a full report, but will probably recommend a method of procedure essentially as follows: The New York State Potato Association, through its president and secretary, will issue certificates of inspection upon the recommendation of official inspectors of the association. The official inspectors are to be appointed by the president of the association upon the recommendation of the Department of Plant Pathology of the State College of Agriculture. The salaries and expenses of inspectors are to be paid by the association. A tax sufficient to cover the expense of inspection and certification will be levied upon the growers and dealers to whom certificates are issued. The time and manner of inspection are to be prescribed by the association through its Committee on Inspection and Certification. It will be necessary to make at least two field inspections — one at blooming time, the other near the close of the season. A third inspection, at digging time or after the tubers have been placed in storage, will be necessary in some cases.

Each certificate issued should bear a serial number, and all the potatoes shipped under a certificate should be bagged at the car in new bags holding 165 pounds. Each bag should have attached to it, when filled, a shipping tag bearing the certificate number, the name of the variety and the words, "Certified Seed: New York State Potato Association." On the reverse side of the tag should appear the name of the local association or dealer shipping the seed; and the grower's name may also appear if he desires it. Certificates may be revoked by the association at its discretion. A grower or dealer making improper use of his certificate should be promptly punished by the revocation of his certificate for the year.

STANDARDIZATION OF POTATOES

E. H. FORRISTALL

What I have to say will deal with methods and distances apart of planting potatoes to insure desirable size potatoes.

I call your attention especially to this board which represents the size of potatoes as agreed upon for standards by the Cortland County Potato Growers' Association. These meshes have a constant variation in size from the largest to the smallest, and there are six meshes in all. The Cortland County Potato Growers' Association adopted, as a standard, meshes 2, 3 and 4 as representing the sizes of potatoes they would sell for seed, thereby establishing a standard for Cortland County potatoes.

It goes without saying that they must be free from blemishes, irregularities and diseases. I call your attention to these potatoes that have been graded according to this standard. Note the uniformity of these three lots graded through meshes 2, 3 and 4. I might add that these potatoes are known in Cortland County as the Norcross Seedling, a white sprout potato of remarkably good quality and noted as being a heavy yielder.

The farmer who buys potatoes of these sizes will not have to invest in a lot of potatoes varying in size from the very large to the very small. He also is insured of a better crop than when he invests in seed of all sizes.

Let us look at this chart showing results of grading in tuber unit work on the farm of Frank Carter:

VARIETY	Yield per acre	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Total seed	Total rejected
		Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Norcross Seedlings.....	363 bu.	9	19	52	16	3	1	87	13
Norcross Seedlings.....	469 bu.	13	14	28	22	2	3	64	36
Norcross Seedlings.....	272 bu.	4	34	24	30	4	....	88	12
Norcross Seedlings*....	302 bu.	....	....	....	....	....	....	90	10

*Result of seed purchased from Mr. Carter by H. R. Talmage, Riverhead, L. I., and planted on Long Island.

You will note that the number of units averaging 363 bushels per acre gave a total of 87 per cent seed stock. Also, that those

units averaging 469 bushels per acre run 64 per cent. Those averaging 272 bushels per acre gave 88 per cent. Potatoes similar to those used in tuber unit work were sent to Mr. H. R. Talmage, of Riverhead, L. I., and planted by Mr. Talmage on his farm. Of the 28 lots tested out by Mr. Talmage, this particular variety from Cortland County gave a yield of 302 bushels with 90 per cent seed stock and 10 per cent rejected, according to his figures.

This chart shows us that the extra heavy yield of 469 bushels over the other two units resulted in a large percentage of potatoes too large to grade, also more of the very smallest size. These potatoes were all planted in rows 36 inches apart, and 16 inches apart in the row. Had these extra heavy yielders been planted closer together, it is possible that we could have had a larger percentage of seed which would result in large money returns per acre.

I wish to call your attention to this chart showing how close planting increases the percentage of desirable seed stock:

Area per hill	Yield per acre	Oversize. Per cent	No. 1. Per cent	No. 2. Per cent	No. 3. Per cent	No. 4. Per cent	No. 5. Per cent	No. 6. Per cent	Total seed. Per cent	Total rejected. Per cent	Value of seed at 50 cents per bushel	Value of total yield at 25 cents per bushel	Gain
3.75 ft.	310 bu.	27	4.43	21.29	41	21.16	6.71	5	83.42	16.28	\$129.30	\$77.50	\$51.80
7.44 ft.	281 bu.		11.33	22.33	21.33	12.67	5.17	17	56	44	80.65	70.25	10.43
Difference...	29 bu.								27.42		\$48.62	\$7.25	

The first line gives averages taken from grading on seven farms. Note the yield per acre of 310 bushels — total seed 83.42 bushels. The value of that seed at 50 cents per bushel, or the price of seed stock for 1914, gives a value of \$129.30 per acre. If this entire crop had been sold at the cars, at the ruling price of 25 cents per bushel, it would have returned to the farmer \$77.50 per acre. This farmer has gained \$51.80 by growing seed potatoes at 50 cents per bushel and grading the same according to this standard. Besides this, he has practically 50 bushels of large and small potatoes to be utilized on the farm as food for his stock.

Let us see what six other farmers received when following the old custom of planting their potatoes far apart, allowing 7.44 feet per hill. Their average yield per acre was 281 bushels. Planting far apart has given them an average of 27 per cent oversized potatoes, undesirable for table use or seed stock. They are the kind of potatoes that we ordinarily get when we order mashed potatoes in the restaurant. These six men have an average of 56 per cent seed stock, which, at 50 cents per bushel, would net them \$80.68. The entire crop marketed at the car (this includes the very smallest as well as the oversized potatoes) would bring \$70.25. These men by grading their potatoes and selling according to this standard would have gained \$10.43. However, from my point of view, this seed would have been very undesirable because it had not been properly grown. In addition to the \$10.43 gained, they would also have had 123 bushel of potatoes to feed to the stock.

Closer planting, then, not only gives us larger yields per acre, but stock that is more desirable either for table use or for seed. It also gives a larger money return for labor. We find that by closer planting of potatoes in Cortland County the farmer can decrease the area planted by 38 per cent, or a little more than one-third, and receive the same for his potatoes as he formerly did when he planted by the old method. This is a saving of labor, fertilizer and ground that can be employed to grow other crops. In other words, it is a better utilization of the soil.

This third chart shows that potatoes will ordinarily grade the same when planted the same distances apart on practically the same kind of soil, whether yielding heavy or light.

RESULTS OF TWO YEARS' GRADING OF POTATOES ON FARM OF M. F. WEBB

Year	VARIETY	Yield per acre	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Total seed	Total rejected
			<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>		
1915	Green Mountain...	110 bu.	.....	10	27	45	10	8	82	18
1914	Green Mountain...	250 bu.	4	12	33	37	6	8	82	18

In a year like 1914, when we had a crop of potatoes in the United States equivalent to 114 per cent, and these potatoes were allowed to go onto the markets unstandardized, the result was that the price per bushel was below what they had actually cost the farmer to raise, many potatoes being so large that they were undesirable. This caused the city dealers a great deal of expense in grading, if they were to get the most returns. This expense means storage, rent, insurance, and labor of men doing the work of getting rid of the culls at a low price. The alternative is to sell these potatoes to the poorer trade, taking out the commission and returning the balance, if any, to the farmer.

If every farmer in the United States had graded his potatoes in 1914 according to this standard, practically 82 per cent of our entire supply would have been put on the market. The ten-year average is 74.6 per cent. As this year's yield is estimated at 74.2 per cent, you see that we are practically normal, and potatoes are selling for from 50 to 85 cents per bushel. An 82 per cent crop could be marketed at a price that would allow the farmers fair remuneration for raising potatoes.

Let us consider potatoes that grade through meshes 3 and 4 that conform to this standard for smoothness, etc. They will waste only about 7 per cent in cooking, while large, irregular potatoes will waste from 17 to 30 per cent.

In conclusion:

1. Selected seed gives larger yields of desirable sized potatoes.
2. Planting far apart increases the size of the potato and lowers the value of the crop.
3. Quality is affected by method of planting.
4. The general public should be educated to the value of a reasonable sized potato, smooth and free from blemishes.
5. All large and irregular, as well as small potatoes, should be marketed through the stock on the farm.
6. Undesirable potatoes should never be allowed to come in competition with standardized stock.

STANDARDIZATION OF POTATOES

C. B. TILLSON

The standardization of potatoes with which the speaker is familiar has reference to seed potatoes rather than to table stock. In fact, so far as I have been able to learn, outside of a small section of Long Island very little work has been done in this state in the way of standardization of table potatoes. I suppose this is due quite largely to the fact that the public is not as yet fully aware of the advantages that would be derived from a standardized table potato.

One must admit that it costs a little more to make a standardized product of any commodity than it does to produce the ordinary stock run. This means that the producer will be obliged to demand a little higher price for standardized potatoes than the ordinary field run. Until the consumers begin to see the advantages of paying this extra price I suspect that the practice will not become general. Of course, this same thing holds good with the seed potatoes, except that the buyers of seed potatoes already realize the importance of the standardized seed potato and are willing to pay the extra expense in producing it. In fact, a great many of the large buyers of seed potatoes make price only secondary, provided they can get a standardized potato of the right quality. They are willing to pay well for it. This makes the standardization of seed potatoes a very easy matter.

In the northern part of the state we have not advanced the work of standardization of potatoes to cover all the different phases of it that we expect to as the work grows. The principal thing that has been emphasized thus far is to produce from high producing stock potatoes which are practically free from disease. After we have succeeded in obtaining stock that will meet with the approval of the most exacting along this line, then we shall attempt to grade the potatoes according to size, and standardize each grade. I do not wish to be misunderstood by saying that as yet we have paid no attention to size. This is not true. We have from the start produced medium-sized uniform potatoes, but have not separated them into different grades according to size.

By fairly close planting we have found it very easy to avoid the overgrown potato. On some of the poorer potato soils we find it necessary to plant farther apart in order to insure sufficient size.

The maximum amount of disease that should be tolerated in certified seed potatoes is a matter that has not been definitely decided upon in this state. At the present time definite plans are being made for the establishment of the standard to be used in the certification work. In my judgment, this is one of the most important things that the potato growers of this state have undertaken. After we once have this standard worked out and adopted, it will be possible to turn out a uniform article from the different potato-growing sections of the state.

Personally, I am desirous of a high standard. Still, I think it is of the utmost importance that the standard for certification be low enough at the start so that the best potato growers will be able to qualify within a comparatively short time — say one or two years. I think I can see where there would be great danger of having the standard so high that it would be possible for a farmer only here and there to produce seed potatoes that would be accepted as certified. From year to year it will be possible, undoubtedly, to raise the standard by decreasing the maximum amount of minor potato diseases that will be tolerated.

Although a few states of the more important potato-growing sections have adopted plans for certification work, it seems best at this time for the State Potato Growers' Association to undertake this work until we know definitely the standard that should be set and maintained. After this standard is once recognized to be the ideal standard, then the state department of agriculture can be of the utmost assistance in carrying it out. I think by working through the State Potato Association we will be able to relieve the state department of much experimental work in arriving at the proper standard.

There is no phase of the potato-growing industry that looks more favorable at the present time than the production of standardized seed. The same thing undoubtedly will hold true with table stock just as soon as both the producer and consumer realize the importance of putting upon the market a standardized article.

POTATO STANDARDIZATION

ORRIN F. ROSS

Mature potatoes, free from blemish, of ideal shape and size, at a low market price, are desired by the consumer. The grower first of all wants a large yield per acre and the highest market price he can get per bushel. These two desires are wide apart, and can only be brought closer together by the consumer paying the full price for the extra effort and the probable reduced yield to the grower. In other words, I believe standardization is but a cold business proposition, where the buyer can secure any grade he desires whenever he is ready to pay for effort, time and material used to produce the desired grade.

In the United States most of the potatoes are sold for table stock without grade or restriction. The most desirable size for this trade is between five and ten ounces, and some markets will pay a small premium for such stock, especially large hotels and restaurants. There is a still smaller demand for tubers weighing over ten ounces, used for potato products by manufacturers. I am also informed that some sections and restaurants want a grade smaller than six ounces. On most markets the large and the small potatoes can be mixed and sold for a price slightly under the regular grade offered. Where size alone is the main consideration all parties can be supplied at a small increase in cost by passing the "field-run" over a standard grader adjusted to make the three grades desired at one operation. However, if the other desires of the consumer are met, the cost will be greater in proportion to the demands, because to secure these conditions something must be supplied that machines do not possess.

The size, other things being equal, is influenced in the field by the distance apart in the row, but what this distance shall be depends upon many factors; such as, season, climate, soil, fertility, variety and set, or the number of tubers per hill. The important factors in growing the tubers to a large average size are: a long and favorable growing season, right climate, with good potato soil, plenty of plant food, and a large variety having few tubers per plant. With these conditions present the plants

should be closer in the row than when these factors are absent, in order to secure the greater percentage of tubers of medium weight. It has been my experience with growers that they desire large tubers which usually yield heavily, are easily harvested, and have brought regular market prices when delivered at the shipping point. If the above considerations are correct it would seem that the practical way to meet the standards for table stock is to use a mechanical grader for size, and secure the type and quality by sorting and selecting the seed stock used to produce the crop.

The buyer or grower of seed stock should have in mind qualities other than appearance. Every grower should desire first of all a large yield per acre, because this usually means a small cost per bushel for production, and his profit is the net margin between his cost and sale price, times the quantity. He should have the same sum left for profit if he cleared 10 cents per bushel on a 400-bushel per acre crop that he would have if he cleared 20 cents per bushel on a 200-bushel crop, but in practice he usually nets more per bushel on the 400-bushel crop and makes four times the profit on the 400-bushel crop over the 200-bushel one. Therefore it would seem that the first and most important factor to consider is hereditary characteristics for a large production. To obtain a large production because of climate, soil, fertilizer or a favorable season, does not add to the value of the tuber for seed purposes. Any one who has done selection work and isolated pure lines for a number of years, has learned that different lines will vary more than 100 per cent in yield, owing to seasonal and fertility conditions; but that, side by side, one line will more than double the yield of another year after year no matter what the conditions. This must be due to the inherent characters possessed. During the past year I have helped harvest lines in their second and third year of development, which showed within an extreme range of four tubers difference in counting 100 hills; also that the shape was as uniform as the set.

To give methods or results of our selection work would make this article too long, but it is safe to say that any variety or group contains enough variations so widely different that a grower can secure any desirable character by isolating a hill showing these, until enough seed is secured to plant his entire field. Many hills

should be used, and the least desirable lines discarded each of the three years. My experience during the past three years with many fields leads me to believe that the quickest, surest and most practical means of securing a potato that will give large production, of ideal shape, and free from inherent disease, is by selection for these characteristics, and developing this line pure until all the field can be planted from it. Then practice a method of elimination of all weakness or disease that may creep in. I should suggest that each year the home seed be dug by hand and every undesirable hill discarded. To do this the plants should not be close enough so that the hills cannot be separated when dug. If the seed trade wants and will pay extra for potatoes to run under ten ounces, then they can be crowded, and a type may be selected having a large set. Growers might profitably use planter size taken out with a grader, providing the parent hills are thoroughly rogued each year. The practice of using small potatoes from the bin year after year cannot be too severely condemned, because the greater number of these small tubers are produced by the poor, weak and diseased hills.

INJURIOUS INSECTS

DR. E. P. FELT

CODLING MOTH AND SIDE INJURY

Studies of the codling moth in cooperation with the Bureaus of Farmers' Institutes and of Horticulture of the State Department of Agriculture, and the Monroe County Farm Bureau, have shown serious "side injury" during the last few years in the apple belt from Rochester westward. In some instances 20 per cent or more of the yield bore the small and characteristic bluish produced by larvae hatching from late-deposited eggs of the first brood. The pests enter the side of the apple usually the latter part of June or during the first half of July, eat a shallow circular gallery with a radius of about one-sixteenth of an inch: and then, in large measure, desert the place of initial injury and migrate to the blossom end where they frequently succumb to the poison applied just after blossoming. This type of injury is much less common in the Hudson Valley and appears to be most prevalent near the shore of Lake Ontario.

Experiments in three counties — Niagara, Orleans and Monroe — show an average reduction of wormy apples in three orchards, resulting from a second spray for the codling moth, of but 1.29 per cent, for the third of only 6 per cent, or for the two additional sprays, of less than 2 per cent. These figures compare very closely with those obtained in the Hudson Valley and strongly confirm our earlier conclusions relative to the great value of the application just after the blossoms drop, for the control of the codling moth.

In all fairness it should be added that the results obtained in the Niagara and Orleans county orchards were not entirely satisfactory so far as the percentage of wormy apples is concerned, this ranging for plots, in the case of the former, from 13 to 14 per cent, and for the latter from 27 to 34 per cent on the sprayed trees, and on the checks from 67 to 69 per cent. By far the greater portion of this infestation, 9 to 12 per cent in one case and 25 to 33 in the other, was due to "side injury." The explanation of this condition is found in the fact that the "side

injury" is produced by young caterpillars hatching from eggs laid by moths developing from overwintered apple worms or larvae, and as these begin feeding on the comparatively unprotected growing surface of the fruit, the probability of destroying them at the outset and before they have inflicted this blemish, is not good. A summary of all the plots shows a reduction in "side injury" of only a little over 1 per cent as a result of the second spraying for the codling moth. It is obvious from the above that the condition of the fruit, especially in sections where there may be considerable "side injury," depends to an appreciable extent upon the work of the preceding year. There are orchards in the western fruit section, and one of our experimental orchards belongs in this class, which are comparatively free from codling moth, the total infestation being approximately 5 per cent or less and, in the case of the check trees of this experimental orchard, amounting to only 6.36 per cent. It is noteworthy that this comparative freedom occurs in sections where the codling moth is known to be abundant, and also in orchards habitually sprayed but once for the pest. There is this in common for the trees nearly free from codling moth injury, and that is they have been sprayed annually whether in fruit or not and it is more than probable that the treatment was thorough. Our conclusions may be briefly summarized as follows:

The first spraying for the codling moth, the treatment just after blossoming, is by far the most effective method in controlling the pest.

The presence of abundant "side injury" is a most potent argument for thorough, *annual* sprayings for the codling moth whether the trees be fruiting or not. This may not be necessary where "side injury" is not serious; as, for example, in the Hudson Valley.

The second spraying for the codling moth would probably be more effective in reducing "side injury" if it were made the latter part of June, though so far as checking this pest is concerned, it does not seem to be essential. In the case of orchards badly infested last year, another late spraying may be advisable between the fifth and tenth of July, something depending on seasonal conditions.

Both the usual second and third sprayings for the codling moth, even if they have comparatively little influence in reducing the numbers of this pest, are abundantly justified in localities where scab is more or less prevalent; assuming, of course, that a fungicide is universally added to the poisoned spray.

APPLE MAGGOT

The apple maggot is becoming locally abundant in some sections and there is now a keen interest in methods of controlling this pest. Its work is easily recognized by the irregular, brown, sometimes rotting channels in the flesh or pulp of the fruit. The insect displays a marked preference for the late summer and early fall varieties, though it also attacks winter apples. The evidence at hand indicates it to be a somewhat local form, and while there may be some disagreement as to the best method of controlling this pest, there is little question but what material benefit may be secured by the collection and destruction, by feeding or otherwise, of the late summer and early fall varieties twice a week, and of the fall and winter varieties once a week. The object of this procedure is to destroy the maggots before they have had an opportunity of escaping from the fruit and entering the soil, where they pass the winter within a few inches of the surface. Thorough cultivation is doubtless of value, since it produces conditions more or less unfavorable to hibernation.

SAN JOSE SCALE

San José scale has been less abundant in some orchards than in earlier years, and examinations in several infested and unsprayed orchards in the town of Schodaek show a decrease in the infestation compared with that of two years ago. The reduction is probably attributable in large measure to the activities of various small parasites. The condition of most of these infested trees, however, is not entirely satisfactory, and although the damage resulting from scale infestation in such localities is much less than that of earlier years, we do not consider that conditions justify the abandonment of the dormant application for the control of this pest. Aside from the check upon San José scale, it is our opinion that incidental benefits resulting from the treatment more than meet the cost of the application.

WHITE GRUB

White grub injury has been very serious in portions of southern Rensselaer and northern Columbia counties at least. These insects have a three-year life cycle, the most serious damage being inflicted the season after the beetles are most abundant, consequently the probabilities of damage in one year may be approximated somewhat by the amount of beetle injury to the leaves of hickory, ash, butternut, black walnut, elm and birch the preceding season. The subsequent infestation by white grubs is most likely to develop in the more vigorous sod near injured trees, for the simple reason that the beetles are very apt to seek the nearest available grassy shelter after feeding during the night. Infestation can also be determined in a general way at least, by examining grass sod either in the fall or spring, and if small, white grubs a quarter of an inch in length or thereabouts are numerous, material damage may be expected the following summer.

Susceptible hoed crops such as corn, potatoes and strawberries should not be planted upon land badly infested by partly grown grubs. It is safer to sow with any of the small grains, especially rye, since this greatly increases the chance of a portion of the crop escaping damage. The nearly full grown grubs now in the soil under badly infested grass have almost completed their feeding; and, if planting with susceptible crops such as corn or potatoes is delayed till the latter part of May or early in June, there will be decidedly less chance of serious injury resulting. Farmers in areas subject to white grub outbreaks should be very careful about planting upon recently turned sod, especially at the three-year intervals when there are good probabilities of serious injury.

SOME INJURIOUS INSECTS

PROFESSOR P. J. PARROTT

THE PEAR THRIPS

Of special interest to institute workers who are to attend meetings in the Hudson River Valley is the new orchard pest known as the pear thrips. For several years it has been very destructive in the region about Germantown, and during the past year it caused severe damage across the Hudson river in pear orchards about Milton and Marlboro. An account of the species is given in Geneva Bulletin 343. The pest is a difficult one to combat because of the nature and suddenness of its attacks. Spraying is the most efficient method of control. The period for effective spraying is during the time when buds are breaking and until they are entirely opened at the tips. The most efficient mixtures are nicotine preparations in combination with an oil emulsion or soap. A very satisfactory formula is three-fourths pint of nicotine solution (40 per cent) in one hundred gallons of water, adding from two to five pounds of soap. Apply the mixture in liberal quantities as a rather coarse, driving spray, holding the nozzles fairly close to the trees in order to force the liquid into the ends of the buds. When petals drop repeat the treatment to destroy the larvae. Considerable protection may be afforded to the trees by a heavy application of whitewash as buds are beginning to break at the ends. The whitewash is made by taking eighty pounds of quicklime for each one hundred gallons of wash. This should be strained through fine brass screening before applying.

THE ROSY APHIS

This species was much less injurious this season than during the previous year, but in occasional orchards about Spencerport, Wolcott and Geneva there was considerable evidence of the destructive work of this pest. Insects of this character are generally hard pests to combat, and this aphid in particular presents a series of difficulties which are not usually encountered in a single species. The destructiveness of the rosy aphid is attributed to its partiality for blossom and young fruit-clusters, and its habit of multiplying to maximum numbers at the time when

the vigor of the tree is required for the development of the young apples of the current year's crop. The susceptibility of the "baby" apples to injury suggests the importance of spraying at an earlier period than is usually done by most fruit-growers. Experiments by this station point to the destruction of the newly-hatched aphides on the opening buds as the most important step to reduce injuries by this pest. See Geneva Bulletin 402. Thorough spraying of the opening buds will completely destroy an associated species, the oat aphid, as well as afford temporary relief from the green apple aphid. The possibilities of combating the rosy aphid by this treatment are indicated in the following table which summarizes the data of a spraying experiment in an orchard of Rome apple trees, with some interplantings of other varieties.

SUMMARY OF EXPERIMENT AGAINST THE ROSY APHIS

Number and Variety of Tree	Treatment	Centers of Infestation	Fruits Injured	Leaves Curled
18 Rome	sprayed.....	46	33	172
10 Mixed varieties.....	sprayed.....	8	0	29
7 Rome	not sprayed..	319	279	1323
Average per sprayed Rome		2.55	1.83	9.55
Average for all sprayed trees.....		1.93	1.17	7.17
Average for unsprayed Rome		45.57	39.85	189

THE CHERRY LEAF-BEETLE

The fact is probably well known to most institute workers that the greatest surprise of the season, at least to students in entomology, was the appearance in large numbers of the leaf-beetle (*Galerucella carvicolis*) upon cherries and peaches during early summer. The species was widely distributed throughout western New York, and was probably more numerous and destructive in the southwestern section, especially in Chautauqua, Cattaraugus and Erie counties. Complaints of its ravages were received from Arcade, Wellsville, Alden, Irving, Batavia, Rochester, Eden, Jamestown, Randolph, Brant, Angola, Fredonia, Dunkirk, Rochester and Penn Yan. It was also reported as injurious in nursery plantations about Dansville, Clifton Springs and Geneva. Mr. A. B. Buchholz, Horticultural Inspector of the State Department of Agriculture, reported that the beetle was common in the central and eastern portions of Orleans county upon sour cherries and peaches. Mr. L. F. Strickland, Horticultural Inspector of Niagara county, states that the insect was observed at

Sanborn, Lockport, Gasport and Middleport. In some gardens it did considerable damage to both fruit and foliage of cherry trees. Several growers reported considerable numbers of the beetles on foliage of young peach trees. The principal damage was in the southern portion, and there were no complaints of injuries by the insect for the northern section of Niagara county.

According to Mr. F. Z. Hartzell of this station the beetles were first discovered at Fredonia on June 7, although they appeared nearly a week earlier in the southern portion of Chautauqua county. He states that the creatures were observed at this time on potatoes, milkweed, timothy, roses, dahlias and grapes, but apparently they did not feed on these plants. The insects obtained their subsistence from cherries and peaches, preferring sour cherries and peaches. Sweet cherries escaped with little damage to foliage. Young plantings of sour cherries as well as of peaches suffered the most, and in these the trees often sustained considerable defoliation. Serious injuries were occasionally detected on old sour cherry trees, but with these the damage was usually confined to the lower limbs. However, at Jamestown a large isolated cherry tree was noted on June 8 with the foliage almost riddled; while many of the green cherries had been eaten by beetles. Extensive feeding of foliage was also observed on mature peach trees.

On the station grounds at Geneva the insect showed a decided preference for the Mahaleb cherry; and, while the entire foliage of trees of this variety was much eaten, the common sweet and sour cherries suffered relatively little harm. This is an interesting fact as sour cherries of such sorts as Montmorency and English Morello are usually worked on Mahaleb stock; and the occurrence of extreme injuries to shoots and suckers of cherry trees, as reported by some correspondents, is probably explained by the partiality of the pest for the above species of cherry. This is of European origin and has escaped from cultivation, being commonly found in the neighborhood of nursery centers. The insect was observed by Mr. Hartzell feeding on the red or bird cherry (*Prunus pennsylvanica*), and its attack on this plant were similar in nature and extent as recorded for cultivated cherries. No evidence of the insect securing subsistence on the choke cherry (*P. virginiana*) or the wild black cherry (*P. serotina*) came to our attention.

The first eggs observed to be deposited by the beetles were found June 11. These were placed either singly or in clusters in the soil at the base of the tree, although some were observed adhering to the bark as if glued by the female. The eggs were lemon yellow in color and measured about .75 mm by .5 mm. The egg-laying period continued until about July 1. In the laboratory eggs hatched in twelve days. In the soil about the bases of the trees, the egg stage averaged between two and three weeks. The larvae resembled those of the grape flea-beetle in size and colorations and were observed during the month of July. They found their subsistence on the foliage, especially that of the shoots which sprung from the base of the tree. Pupae were not observed and no observations were made on this stage. There is yet much to be learned as regards the life history and habits of the insect. It appears that the insect hibernates in the adult stage, the beetles coming forth and feeding on the leaves of the wild bird cherry. In the absence of this host they seek cultivated cherries and peaches.

Experiments conducted under the direction of Mr. Hartzell at the Fredonia laboratory showed that arsenate of lead or arsenate of lime, at the rate of eight pounds of the arsenical to one hundred gallons of water, afforded efficient protection to the trees if the lower as well as the upper surfaces of the leaves were well sprayed. With cherries the most satisfactory results were obtained when the poison was combined with bordeaux mixture. Arsenate of lead produced some defoliation of peaches. Because of these injuries tests were conducted with nicotine solution, which proved entirely safe to the trees and destructive to the beetles that happened to be on the foilage at the time of spraying. This treatment, however, will not prevent reinfestation.

For small cherries that are infested with large numbers of beetles, jarring the trees is advised. The beetles should be caught in pans containing a small quantity of kerosene. This operation, if repeated several times, will prove very effective and not cost any more than spraying. It possesses one advantage over spraying in that it affords immediate protection. As it requires some time for an arsenical to exert its toxic properties many beetles on a small tree may do considerable harm before they succumb to the poison.

DUSTING METHODS IN ORCHARDS

PROFESSOR C. R. CROSBY

The experiments in dusting apple orchards the past season have confirmed the results of previous years that arsenate of lead applied in the form of dust in combination with finely ground sulphur, gives as good or better results in the control of codling moth than does the usual liquid applications. The detailed results of these experiments will soon be published in a bulletin of the Cornell Experiment Station. The dusting method of treating apple trees is more rapid and convenient, and is of especial value to growers, who, because of large acreage, are unable to cover their orchards at the proper time. Growers are not advised to discard their spraying machines, but under certain circumstances will find the dusting method of distinct advantage. As yet no method has been devised of using dust for the control of scale, plant-lice or red bug.

PLANT DISEASES

F. C. STEWART and M. F. BARRUS

APPLE SCAB

The past season has been exceptionally favorable for the development of scab, and the disease as a result has been abundant. It has been controlled in a satisfactory manner where applications of lime-sulphur solution or of sulphur dust have been made during the summer. The late July application was very helpful not only in keeping the fruit from becoming affected with scab late in the season, but also in keeping it free from sooty blotch, the name applied to a superficial blemish resembling scab, occurring on the skin of the fruit, and caused by a fungus that develops during moist weather. This disease has prevented many otherwise good apples from classifying in grade A.

POWDERED SULPHUR

The applications with powdered sulphur have proved to be as successful this year as in the past, and there seems to be no good reason why the method should not continue to give as good control measures as the spraying method and at no greater expense. It has the advantage of being more rapid and more convenient. It has at the present time the disadvantage of being ineffectual as a dormant application and as a measure to control aphids. While there is no reason why these growers now completely equipped with spraying machines should discard them for dusting machines, there are growers now unable to cover their entire orchard rapidly enough who could dust to advantage. The dusting method will also enable those having a small number of trees to provide themselves at slight expense with means of controlling fruit and foliage diseases and biting insects.

PEACH LEAF CURL

Recent experiments have clearly indicated that this disease, so common during the past two years, can be as readily controlled by fall applications of lime-sulphur solutions as by spring applications. In fact, the application can be made at any time after

the leaves have dropped and before the buds have started in the spring, although, of course, no applications should be made during freezing weather.

This is welcome news to the peach grower as it will enable him to relieve the pressure of spring work by disposing of some of it during the fall or winter. It also gives him an opportunity to spray when the ground is solid enough to hold up while driving over it with a heavy machine.

PEAR BLIGHT

There is nothing new of practical value to present about this disease. No new varieties of economic importance have been discovered to be resistant to the disease, nor has any method of preventing the blight by injecting chemical substances or viruses into the tree been devised. The same methods of control as have been advocated in the past are recommended today. These methods, if carefully carried out, will keep the disease in check, but will not prevent new infections from taking place. The secret of success in the control of fire blight consists in the cleaning out of hold-over cankers and twigs, in the removal of new infections as soon as they are observed, and in the disinfection of wounds. Most growers are not prepared to do this and, therefore, do not succeed in the attempts they make. This method can most effectively be applied by one familiar with the details of the work. Large growers or a group of smaller ones could profitably employ such a man to fight fire blight for them.

OAT SMUT

Many thousands of dollars were saved to farmers of the state this year by their treating oat seed with formaldehyde solution, yet only a small fraction of the oat seed used was treated. In every community oat smut was much in evidence and in some fields the loss amounted to one-half of the crop. With the knowledge of control at everyone's command there should be no loss from this disease.

A few farmers who treated their seed this year reported a partial failure inasmuch as there was some smut found in their grain. Failures of this kind may result from using a solution

that is less than 37 per cent formaldehyde; by not diluting properly (1 pint formaldehyde to 45 or 50 gallons of water); by not using enough solution (at least 4 gallons to every 5 bushels); by not cleaning the seed before treatment to remove smutted kernels (if these are too numerous cleaner seed should be secured); by not treating all the seed (the seed under foot should be taken care of); by not covering the seed well enough after treatment, nor leaving it covered long enough (4 or more hours); by permitting the treated grain to come into contact with contaminated sacks, floors, bins, drills, etc. (the sacks may be disinfected by soaking 10 minutes in the same solution used for the seed and they may then be used in covering the pile, while floors, bins, drills, etc., may be washed or sprayed with a stronger solution.)

A new method of treating oat seed with formaldehyde for the control of smut has been devised by Mr. R. J. Haskell of the College of Agriculture in which fifty bushels of seed is sprayed with one pint of 40-per-cent formaldehyde without dilution. The oats are spread out on the floor and the formaldehyde applied with a hand-sprayer or atomizer, after which they are shoveled into a pile, covered well with canvas or blankets, and left for several hours. This method has given very satisfactory control without injuring the grain, in tests at the College and also with about twelve farmers who used the method this year. It has the advantage over other methods of leaving the grain dry and ready to sow as soon as treatment is completed. However, when the formaldehyde was diluted with water enough to appreciably wet the grain, but in smaller quantities than is recommended, considerable injury to the grain resulted.

It is inadvisable to treat the seed with formaldehyde longer than a month in advance of sowing, because of danger of injuring its germinative power.

STINKING SMUT OF WHEAT

This disease is becoming quite generally prevalent in New York State and often occurs in large percentages. Not only is the grain affected a total loss, but the remaining healthy grain is reduced in value as it is unfit for flour and must be used for other purposes.

The treatment with formaldehyde is cheap, convenient, and effective. When grain containing smutted kernels is to be used for seed, it should, after being cleaned, be dipped in a solution made by diluting 1 pint of 40-per-cent formaldehyde in 45 gallons of water. A tub or half barrel is best for dipping, about a half bushel being immersed at a time. After skimming off smutted kernels on the surface, the immersed grain should be stirred to release other smutted kernels imprisoned there. When no smutted kernels can be secured, the grain may be removed and dried. A wire screen basket made to fit within a half barrel or tub facilitates the work, as it enables one easily to remove the grain from the liquid. A large piece of burlap placed over the tub may be used in the same way.

If the grain contains no smutted kernels it may be treated by sprinkling as is recommended for oats. Grain from fields containing no smut, that has become contaminated at thrashing time or in some other way, may be treated in this manner.

Loose smut cannot be controlled by this treatment; and, if severe, the best method of avoiding it is to secure seed from smut-free fields.

TOMATO BLIGHT

This disease caused by *Septoria lycopersici* has been severe the past year and may be destructive in the future. The disease can be controlled by spraying with bordeaux as for potatoes. Several applications should be made. With the present methods of growing the crop it is rather difficult, if not impossible, to use power sprayers without doing more injury than good. Where a hand sprayer can be used the spraying can be done with satisfactory results.

BEAN ANTHRACNOSE

There are three methods by means of which this disease may be controlled, namely, spraying with home-made bordeaux, practicable only in gardens or in seed plots; using resistant varieties when these can be secured; and selecting seed from clean pods, the most promising way for most varieties and conditions.

To carry out the work according to the latter plan it is necessary to select carefully, by examining every pod, a sufficient number of clean pods to secure enough seed for planting a seed

plot. Pods having even small anthracnose spots should be rejected. The amount of clean seed needed will depend upon the size of the seed plot, to be sure, and this in turn depends upon the acreage the farmer intends to plant to beans. The seed plot should be of sufficient size to produce enough seed for planting the main fields the following year. The shelled seed should be carefully re-sorted and stored where it will not become mixed with other seed. It should be planted in hills two feet apart and in rows not closer than three and one-half feet. The field should be at least 80 rods (more is better) distant from any other bean field or place where any beans are grown. The seed plot should be sprayed several times during the season with bordeaux mixture. This is especially necessary if a wet season prevails. No person should go into this plot or any bean field when the vines are wet, nor should he ever go directly from another bean field into the seed plot. Whenever anthracnose is observed on any vines or pods in the seed plot they should be promptly removed to a distance from the plot. At the time the vines are ready to pull, especially desirable pods should be selected for the following year's seed plot. The remainder should be thrashed with a flail, or in some other way that will prevent a mixture with other bean seed.

This method, while apparently cumbersome, is in reality comparatively cheap and easy to carry out compared with results secured. Failures are sometimes unavoidable, but with a reasonable amount of thought and care very satisfactory results can be secured.

POTATO DISEASES

Owing to the extreme severity of the attack of late blight the past season this disease was unusually difficult to control by spraying. In many cases fields very thoroughly sprayed blighted quite badly. Nevertheless, we believe that spraying has generally been profitable. At the Geneva Experiment Station rows sprayed with lime-sulphur blighted as early and as severely as unsprayed rows, and gave a smaller yield by about fourteen bushels per acre, while rows sprayed with bordeaux remained green considerably longer and outyielded the unsprayed rows by about sixty-five bushels per acre. Lime-sulphur is entirely worthless as a spray for potatoes.

If blighted potatoes are to be placed in storage they should not be dug until the tops are dead and dry. By so doing the loss from rot will be less than it would be if they were dug and stored while the vines were yet partly green. This has been proven by experiments made at the Vermont Station. Other experiments at the Vermont Station have shown that it is of little use to sprinkle air-slaked lime over potatoes in storage. It does not prevent them from rotting. The best that can be done is to keep the potatoes dry and cool and avoid deep piling.

Leaf-roll and mosaic seem to be much more common and important than we have heretofore realized. Since these diseases are transmitted through the seed it is important to avoid using tubers from affected plants for seed. Leaf-roll is characterized by an upward rolling of the leaves; mosaic, by wrinkling of the leaves and their yellowish green color. The leaves of healthy potato plants are large, flat, smooth and dark green.

Notwithstanding all that has been said and written on the subject it seems that many persons do not yet know the proper method of using corrosive sublimate for the disinfection of seed potatoes. The solution should be prepared by dissolving one ounce of corrosive sublimate in a small quantity of hot water and then diluting to seven and one-half gallons. Since corrosive sublimate rapidly corrodes metals it should not be used in metal containers. Use wooden or earthenware vessels. Soak the tubers in the solution one and one-half hours and spread them out to dry. With repeated use the solution loses strength; hence, after it has been used three or four times, it should be discarded and a new lot prepared. If it is desired to treat for *Rhizoctonia* as well as for scab, corrosive sublimate is preferable to formaldehyde, for the reason that corrosive sublimate is more effective against *Rhizoctonia*. It is also more effective against powdery scab.

FARM ORGANIZATION
BALANCE BETWEEN CROPS AND STOCK, CROP ROTATION, AND LABOR
DISTRIBUTION

K. C. LIVERMORE

It is impossible in so short a time to discuss with any degree of completeness the subject assigned. So I shall bring to your attention only a few more or less disconnected ideas on the subject. I shall assume that you are familiar with the farm management principles explained and illustrated in Cornell Bulletins 295, "An Agricultural Survey of Townships of Ithaca, Dryden, Danby and Lansing, Tompkins County, New York," and 349, "Some Important Factors for Success in General Farming and in Dairy Farming"; Warren's "Farm Management," as well as the recent reports of farm management surveys from the farm bureaus and the office of Farm Management.

FARM ORGANIZATION AND DAIRY CONFORMATION

The essentials of successful farm organization are as simple, as logical and as readily understandable and appreciable as the essentials of good conformation for dairy cows. Years of observation by farmers, and much study and measurement by scientific men, have resulted in a fairly definite ideal of dairy cow conformation. The ideal is generally accepted, probably because the relation of this conformation to high production is essentially physical. Production depends primarily on digestive organs being large enough to receive and handle large quantities of raw material; the circulatory system being capable of conducting large quantities of blood to the udder; and the udder being active and large enough to secrete and store large quantities of milk.

Farm management workers, as a result of investigations and observations, have come to recognize an ideal of farm organization; and the relation of this organization to farm profits also is essentially physical. The ideal is a business sufficiently large and sufficiently diversified to make efficient use of considerable quantities of the raw materials — labor, primarily, and capital; and a business with the rates of crop and stock production somewhat above the average.

ORGANIZATION ON SOME JEFFERSON COUNTY FARMS

To better illustrate the simple physical, in fact almost mathematical, relation between farm organization and profits, some Jefferson county farms will be studied briefly. In Table I the three most important features of a farm business — size, diversity and production — are measured and tabulated. Labor efficiency is also measured and tabulated. The middle column of the table gives the average of 670 farms in that region.

There were 73 crop acres and 15 cows on the average farm. Altogether the business provided 416 units of productive man work. The crop index of 100 represents the following yields per acre: corn 36.4 bushels, corn silage 9.9 tons, potatoes 124 bushels, oats 30.8 bushels, barley 24.4 bushels, oats and barley 33.5 bushels, oats, peas and barley 33.6 bushels, hay 1.44 tons. Receipts per cattle unit amounted to \$61. Of the total receipts from crops and stock, 22 per cent came from crops. Milk was the only product that amounted to \$500. The labor on the average farm was equivalent to 1.7 men for a year. Each man farmed 43 acres of crops and cared for 12 units of productive animals. Each horse farmed 21 acres of crops. There were 244 work units per man and 62 per horse. The average labor income was \$609. This is what the average farmer in that region made above all farm expenses and interest on the capital invested in the business. Besides this the farm furnished him a house and farm products to use.

Now let the size, production, diversity and work rate on the average farm be 100 in each case, and use it as the yardstick with which to measure the same factors on the other farms shown in Table I.

TABLE I
EFFICIENCY FACTORS ON SOME JEFFERSON COUNTY FARMS, COMPARED WITH THE AVERAGE OF THAT REGION

Farm No.	29	110	129	Average of the region	528	536	626
Size of business:							
Crop acres.....	99 } 156	24 } 42	85 } 71	73 } 100	72 } 64	108 } 166	91 } 220
Number of cows.....	27 } 648	8 } 175	8 } 294	15 } 416	10 } 267	28 } 691	35 } 917
Man work units.....							
Production:							
Crop index.....	53 } 50	143 } 152	115 } 88	100 } 100	128 } 144	87 } 92	128 } 139
Receipts per cattle unit.....	\$29	\$95	\$31	\$61	\$100	\$58	\$88
Diversity of business:							
Per cent of receipts from crops.....	0% } 0	0% } 0	49% } 150	22% } 100	40% } 300	21% } 100	0% } 150
\$500 products.....	M \$764	M \$910	H \$660	M \$916	B \$1,205 H \$750	M \$1,855	M \$3,535 C \$500
Work rate:							
Crop acres per man.....	37 } 107	13 } 47	34 } 67	43 } 100	33 } 59	34 } 94	25 } 115
Animal units (except horses) per man.....	13 } 107	6 } 47	8 } 28	12 } 21	6 } 21	14 } 20	14 } 15
Crop acres per horse.....	22 } 107	10 } 97	28 } 118	21 } 244	21 } 121	20 } 216	15 } 248
Work units per man.....	240 } 78	97 } 38	118 } 66	244 } 62	121 } 48	216 } 64	248 } 87
Work units per horse.....	78 } 107	38 } 97	66 } 118	62 } 244	48 } 121	64 } 216	87 } 248
Labor income.....	-\$177	\$106	\$146	\$609	\$1,006	\$1,022	\$1,532

NOTE.—M = milk; H = hay; B = butter; C = cattle.

Farm 129 had a few more crop acres but only half as many cows. There were 294 work units. Its size was only 71 per cent as large as the average. Its crop yields were 15 per cent better, but the cattle were very poor. So its production was only 88 per cent of the average. This farm was a little better diversified than the average. The tendency in that region is toward too great specialization on the dairy, but this farm had 49 per cent of its receipts from crops. Hay was the only \$500 product. The diversity of this farm may be called a little better than the average. The work rate, however, was low, only 67 per cent of the average. There was not enough work on the farm to keep the men busy. This business was weak in size, weak in production, fair in diversity and weak in work rate. As a result the labor income was only \$146, or less than hired man's wages, for the operator.

Farm 110 had a still smaller business. There were only 24 acres of crops and 8 cows, or 175 work units altogether. The business was not half so large as the average, but the production was good — 52 per cent better than the average. Both crop yields and receipts per cattle unit were good. This was the "little farm well tilled." No crops at all were sold and milk was the only large product. So there was practically no diversity. With such a small business and no diversity the work rate was naturally low. Only 13 acres of crops per man were farmed and 10 per horse. In spite of very good production the labor income was only \$106. The other factors overshadowed the one good one.

Farm 29 had a business 56 per cent larger than the average. There were 99 crop acres and 27 cows; 648 work units altogether. But production and diversity were very low. The work rate was about average. With such poor production, the more cows and land this man had the worse off he was. His labor income was \$177; that is, he failed to make interest on his investment — he paid \$177 for the privilege of operating that farm.

On Farm 528 the business was about two-thirds as large as the average. It included 72 crop acres and 10 cows, or 267 work units. The crop yields were 28 per cent better than the average, and the receipts per cattle unit were \$100, or \$39 more than the average. Production on that farm was 44 per cent better than the average. It also had very good diversity. Forty per cent of

the receipts came from crops and there were two important products, butter amounting to \$1,205 and hay \$750. The diversity was probably three times as good as the average. The work rate, however, was low. Only 33 acres were farmed per man and 6 animal units cared for per man. There were only 121 units of productive work per man. This was due mostly to the small size of business. Two factors, size and work rate, were low, but production and diversity were very good,— at least good enough to more than offset the others and give a labor income of \$1,006.

The only strong factor in the business of Farm 536 was its size. There were 108 acres of crops and 28 cows. It was a business two-thirds larger than the average. Production was a little under average with both crops and cattle. Diversity was just average and the work rate was not quite average. With all the factors except size only average or a little below, but with size two-thirds greater than the average, the farmer made two-thirds more than the average labor income, or \$1,022.

Every factor in the business of Farm 626 exceeded the average. The business was more than twice as large. There were 91 crop acres and 35 cows. Some of the cows were registered. The business provided 917 work units. Crop yields were 28 per cent above the average, and the receipts per cattle unit were good. Each man could have handled easily 10 to 15 more acres of crops. The work rate was 15 per cent above the average. If there had been 30 to 50 more acres of crops in the business, probably there would have been some crop sales. As it was there were no crop sales. Milk was the largest sale, amounting to \$3,535, but it was not the only one. There was an income of \$500 from cattle, so the diversity was a little better than average. With size well above the average, and all the other factors above, the resulting labor income was \$1,532.

A FARM BUSINESS COMPARED WITH A BOX

So simple is the relation of profits to organization that we may compare a farm business in a general way to a box. The size of the farm business is comparable to the length of the box, the diversity is comparable to the breadth and the production to the depth. The capacity of a box depends upon its length, breadth

and depth. In like manner the capacity of a farm business, or the labor income, depends upon the size, diversity and production. Sometimes other factors limit profits in farming, just as knot holes or split or loose boards in a box may permit waste. Inefficient labor or inefficient direction of it; over-investments, especially in buildings; low prices; wasteful feeding or feeding more heavily than prices of products warrant; using fertilizer more freely than length of season, rainfall, soil or prices warrant; and unreasonable expenses — are factors that sometimes limit profits. Occasionally a farm is not successful because the type of farming is not adapted to the conditions of the region. New-comers in a region are likely to make this mistake. But all these factors are usually secondary to the three that determine the capacity of a farm business — size, diversity and production.

WHAT IS MEANT BY SIZE OF BUSINESS?

Size does not refer to number of acres alone, nor to number of cows alone, nor to number of hens, acres of fruit, square feet under glass, number of men or to capital alone. It refers to all of these together. It is, essentially, the amount of productive work done.

When farms of the same type are being compared, size may be expressed by crop acres, number of cows, or both together; or by acres of fruit, or some other important item. It is not so easy to compare farms of different types. This accounts for the difficulty some persons have had in understanding the effect of size on profits. By means of "work units" * all the productive work done on a farm may be expressed in one figure. This is the best measure of size for comparative purposes.

The size of a farm business may be increased in three ways: by buying or renting more land — that is, extending the area; by intensifying the business — that is, by growing or increasing the area of crops like cabbage, potatoes, hops, tobacco, fruit, truck, etc., or by keeping more stock or pure-bred stock instead of grades; or both methods may be used. Where land is not too high in price or rent, it is usually better to increase the area. Where land is high priced or cannot be obtained, it is necessary to intensify or sell out and buy a larger farm in another locality.

* See Warren's "Farm Management," page 350.

WHAT IS MEANT BY DIVERSITY

Diversity is usually measured by "percentage of crop and stock receipts coming from crops" and by the number of important sources of income. They are not very satisfactory measures because they do not represent completely the conditions we wish to observe, but no better measure has been devised.

Balance between crops and stock is one phase of diversity. Good balance implies: (1) Enough stock to utilize the land that is suitable only for pasture and the by-product or unmarketable products like corn stalks, straw, bean pods, cabbage refuse, cull potatoes, skim milk, buttermilk, whey, etc., and to furnish some manure. (2) Enough crop land to use efficiently the available manure. Too little land for the manure may be just as unprofitable for the farmer as too little manure for the land.

Labor distribution is another phase of diversity. Good labor distribution implies enough productive work, together with necessary maintenance and improvement work, to keep the regular help employed as profitably as possible throughout the working day and throughout the seasons. It also implies the utilization of available temporary help when there is opportunity to use it profitably. Very seldom should the ideal be to have a constant amount of work through the season. When temporary help is usually available at the critical period (referring to labor requirement), in sections where such crops as potatoes, hops, fruits, tobacco, hay, etc., are important and profitable, the ideal should be to use as much of that labor as other conditions warrant.

Diversity also refers to distribution of income and to insurance against complete failure.

PRODUCTION

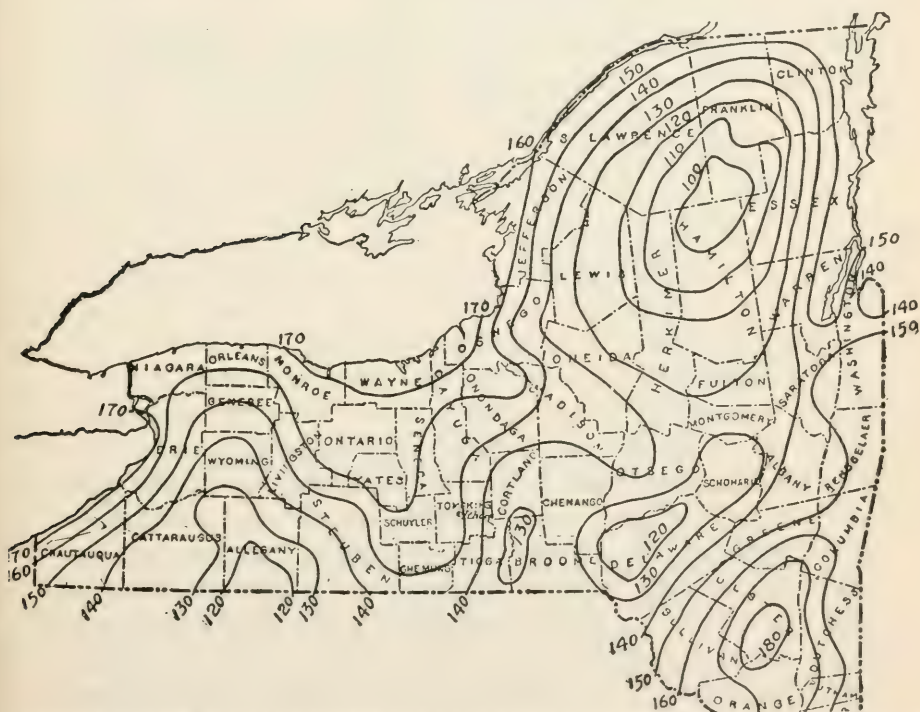
This factor is better understood than the preceding; possibly too much emphasis has been given it in the past. It is no more important than size and diversity.

Production rates of crops depend more upon rainfall, length of growing season and soil, than upon the extra efforts of man. The best way to secure good crop production is to locate on good soil in a favorable climate. The differences in natural productivity of different localities in New York are greater than many people

realize. Rates of production of both crop and animal products that will be profitable depend very much upon prices received. Potato prices do not justify the same fertilizer practices in Franklin county as on Long Island. Cheese factory prices for milk do not justify the same feeding methods as do a wholesale price of 4 cents per quart. Farmers are nearer correct in respect to production rates than many agricultural workers believe.

LIMITS OF OPTIMUM SIZE, DIVERSITY AND PRODUCTION

It is desired only to call your attention to the fact that with all these factors there are upper limits as well as lower. The reasons are made clear in the references cited at the beginning of this talk. The limits vary in different sections, depending primarily on such natural conditions as topography, climate and soil; and secondarily on market facilities, labor supply, etc. This point will be illustrated by the farm records that follow.



AVERAGE NUMBER OF DAYS BETWEEN THE LAST FROST IN SPRING AND THE FIRST IN FALL *

* From Cornell Bul. 316, Frosts in New York, by U. M. Wilson.

WHAT WE DO NOT KNOW ABOUT CROP ROTATION

In general, farmers rotate crops in response to economic stimuli. Most of that which has been written on crop rotation merely explains some of the causes. Practice, in the case of rotation at least, is far ahead of the scientist's recording pen.

Two phases of this practice which have not been explained and which very much need study are: (1) The relation of rotation or cropping system to climate, soil, topography, marketing costs and relative profits of different products. (2) The relation of rotation or cropping system on the individual farms to the live stock enterprises, labor distribution, and to the business as a whole. Agricultural experimenting, extension and teaching in this state would be better if we knew why hops are grown where they are; why wheat growing sections of New York are so clearly defined; why there are apple sections, and a grape belt; why hay is left down only one year in some sections and three to five years in others; why the fertilizer practices with potatoes vary so widely; why beans are not grown in three-quarters of the state; why less and less corn is grown every year; why buckwheat is not grown where it yields best; and a thousand other "whys" like these.

THE SIGNIFICANCE AND VALUE OF COMMUNITY EXPERIENCE

New York has soils as poor in fertility as any in the world, and soils as rich as any in the world. Its soils vary in texture from the lightest sands to the heaviest clays. Between these extremes of fertility and texture are all gradations. Sections of New York have a growing season of less than 100 days — shorter than parts of Alaska; other sections have a growing season of 200 days. Small areas of the state receive so little rainfall that they are almost semi-arid. The annual rainfall in different sections varies from less than 25 inches to over 50; the rainfall for the 5 months, April to August inclusive, varies from less than 14 inches to twice that amount. Topographically the state includes both extremes — the rugged mountains of the Adirondack and Catskill groups, and the gently rolling stretches — the beginning of the prairies — in the northern half of Western New York; as well as all the intermediate phases. Some New York farms are

located 15 to 20 miles from a flag station and 30 or more miles from a town with more than one barber shop; while 85 farms were reported by the last census in New York County, the center of the most densely populated section of the western hemisphere. To meet profitably these widely different conditions many types of farming have been evolved.

The early settlers brought with them their seeds and their stock, their few crude implements, and the methods and practices which had succeeded in their former homes. Immediately there



AVERAGE PRECIPITATION, APRIL TO AUGUST, INCLUSIVE

Compiled November 11, 1915, from all available normals and averages published in Bulletin W.

was begun an experiment of greater proportion and complexity than any yet conducted by an experiment station. Each new settler took an active part, for the results were vital to him personally. It was an experiment to determine what crops and what varieties of each crop paid best on every farm that was cleared; what methods of tillage and seeding were best; what

kinds and breeds of stock were most profitable under those particular conditions; and then what combinations of crops and stock paid the farmer and his family best for their year's work. The settlers came from many different places and each one had different notions to try. Practically everything known at the time was tried and the things that succeeded endured — the others were discarded.

As population increased and markets developed, readjustment became necessary. Extensive building of railroads intensified the competition between different parts of the state, and with other states. The invention of the mowing machine, the reaper and the selfbinder, necessitated changes in types of farming probably as extensive as would be caused by a 50-day lengthening of the growing season. Shifts in the relative prices of products, of land and of labor, and various economic changes, are continually requiring gradual readjustment of types of farming.

So the great experiment is continued and every farmer in the state consciously or unconsciously is helping to conduct it. Thousands of different ideas are tested every year. Any proving profitable soon becomes common practice where they apply. Consequently the types of farming and the practices that are common in various sections of the state represent the accumulated experience of several generations of farmers. The present generation is inclined to overlook the fact that these types of farming and practices are the result of accumulated experience. It does not appreciate the years of labor spent in getting these results; nor the great degree of accuracy that has come from the careful checking of results by hundreds of farmers year after year; nor the most important facts of all — that the results apply strictly to the local soil, the local climate, the local marketing facilities and all the other local conditions, and that they have been worked out strictly on the basis of real profit. The type or types of farming, then, that are generally followed under any given set of conditions in this state or any of the older states, may be considered the best, everything considered, for those particular conditions.

ORGANIZATION ON SOME SUCCESSFUL FARMS

Good crop and stock balance, good crop rotation and good labor distribution for different conditions are illustrated by the following data from some successful farms. The system of farming in each case is fairly typical of many other farms similarly located. The organization and labor income in each case is, however, exceptionally good.

1910 RECORD. TOMPKINS COUNTY, N. Y., GENERAL FARM

Labor Income \$2,432

Size of business.—One hundred and eighty-eight acres in crops; 17 silage, 15 potatoes, 2 cabbage, 15 oats and barley, 12 wheat, 90 hay, 30 oats, 7 apples. One hundred and sixty-four pastured, including 46 in woods. Thirty-one and five-tenths cows, 2 young cattle.

Diversity.—Forty-four per cent of receipts from crops. Three important receipts: milk \$4,200, potatoes \$1,450, hay \$750, oats \$380, wheat \$340, eggs \$300. Four and six-tenths acres of crops per animal unit.

Production.—Crop yields: silage 15, potatoes 277, cabbage 10, oats 50, wheat 31, oats and barley 60, hay 1.9, fruit ?. One hundred thirty-three dollars receipts per cow.

Labor.—One year man, one 9 months, day help 75, son 1 year = 3 men. Forty-seven acres of crops per man. Ten and three-tenths animal units per man. Twenty-seven acres of crops per horse — 7 horses.

NOTES.—Land value about \$85 per acre. Pastured land included woods, stump lot, and land too steep or rough for cropping. Milk sold to shipping station at about 2.8 cents per quart. Good potato soil and climate. Labor distribution was excellent, with emphasis on hay and potatoes—the most profitable crops for the locality. Balance between crops and stock excellent. Late spring frosts limit apple crops. Pure-bred cattle instead of grades might have made this business more profitable.

1913 RECORD. GENESEE COUNTY, N. Y., GENERAL FARM

Labor Income \$2,783

Size of business.—One hundred and seventy-five acres in crops: 25 potatoes, 45 beans, 5 cabbage, 43 wheat, 42 hay, 12 alfalfa, 3 apples. Six acres pastured. Three cows, 2 young cattle; 600 lambs fattened in winter.

Diversity.—Sixty-nine per cent of receipts from crops. Five important receipts: potatoes \$2,438, lambs \$1,970, beans \$1,200, wheat \$902, cabbage \$500. Three and one-tenth acres of crops per animal unit.

Production.—Crop yields: potatoes 150, beans 10, cabbage 5, wheat 24, hay 2.4, alfalfa 3, apples 33. Thirty-three dollars receipts per cow. Three dollars and twenty-eight cents receipts per lamb.

Labor.—One year man, one 8 months, day help 50 = 2.8 men. Sixty-two and five-tenths acres of crops per man. Twenty animal units per man. Twenty-two acres crops per horse — 8 horses.

NOTES.—Land value about \$100. Practically all the land good for crops. Orchard and tillable land had to be used for family cows. Dairy would not

be justified. Land naturally productive and climate good. Adapted to variety of crops. Rotation: potatoes and cabbage on clover sod; beans; wheat; clover. Alfalfa on certain fields as long as good. Loading switch on farm. Crop and stock balance maintained and winter work supplied by fattening western lambs in winter. Nearness to Buffalo markets and the loading switch made this practicable. Lambs made best use of bean roughage. Almost ideal organization and especially good management resulted in very high labor efficiency.

1913 RECORD. MONROE COUNTY, N. Y., FARM

Labor Income \$3,860

Size of business.—Seventy-six acres in crops: 5 corn fodder, 1 potatoes, 10 oats, 3 barley, 1 peas, 14 wheat, 11 hay, 17 apples, 8 peaches, 1 cherries, 1 plums, 4 pears (young). Six acres pastured. Three cows, 2 sows.

Diversity.—Ninety-five per cent of receipts from crops. Two important receipts: apples \$5,800, peaches \$1,000, wheat \$350, plums \$280, hogs \$238. Eight and four-tenths acres of crops per animal unit.

Production.—Crop yields: oats 50, barley 55, wheat 29, hay 2.4, apples 117, peaches, $3\frac{1}{8}$ T., cherries 0, plums 14 T.

Labor.—One year man, one 7 months, day help $250 = 3.4$ men. Twenty-two acres of crops per man. Fifteen acres of crops per horse—5 horses.

NOTES.—Located within 3 miles of Lake Ontario. Season and soil best in state for apples. Land value about \$250. One mile to cold storage and shipping point. Abundance of help in fruit harvest. Tillable land used for cow pasture. Hogs kept on orchard refuse and skim milk principally. General crops furnished horse and cow feed and helped in labor distribution. Good diversity among fruits. Pruning, spraying, manure hauling and plowing when possible provided winter work for the regular force. Cover crops and fertilizer supplemented farm manure in orchard. A dairy would be decidedly out of place. Winter feeding of lambs or other stock would have been impractical because there was no roughage to spare. If more land were to be secured the same system would probably pay best on it.

1914 RECORD. GENESEE COUNTY, N. Y., FARM

Labor Income \$3,919

Size of business.—One hundred and ninety-five acres of crops: 5 corn, 7 silage, 10 potatoes, 32 beans, 2 buckwheat, 8 peas, 13 oats and barley, 38 wheat, 31 hay, 9 alfalfa, 40 apples. Forty-five acres pastured. Thirteen cows, 2 young cattle, 50 ewes.

Diversity.—Eighty per cent receipts from crops. Six important receipts: apples \$3,700, beans \$1,216, wheat \$1,100, milk \$960, lambs and wool \$488, hay \$448. Four and nine-tenths acres of crops per animal unit.

Production.—Crop yields: corn 45, silage 14, hay 2, potatoes 100, beans 20, oats and barley 36, wheat 32, alfalfa 3, apples 102. Seventy-four dollars receipts per cow. Six dollars and fifty cents receipts per ewe.

Labor.—Two year men, day help $457 = 4.5$ men. Forty-three acres of crops per man. Nine animal units per man. Twenty-eight acres of crops per horse—7 horses.

NOTES.—Located about 1.5 miles from railroad, milk station and city. Soil and climate good for general crops, especially beans. Good apple conditions though not best. Orchard was on farm when owner bought. Land value about \$100 per acre. Forty-five acres of creek bottom suitable only for pasture. Cows and sheep kept to utilize this and to consume roughage. Some sheep instead of all cows probably kept because of abundance of bean roughage and to have less chore work in summer when crop work is pressing. Cropping system provided, first, silage for corn and grain for horses, then, best crops for region in satisfactory rotations. Two rotations: 1. Corn and potatoes on clover sod, beans and spring grains, wheat, clover. 2. Beans on clover sod, wheat, clover. Alfalfa down as long as good. Doubtful if organization or system could be improved.

1913 RECORD. DELAWARE COUNTY, N. Y., GENERAL FARM

Labor Income \$2,359

Size of business.—Sixty-four acres in crops: 55 hay, 5 alfalfa, 3 oat hay, 1 apples. Two hundred and twenty-five acres pastured, including 40 woods. Fifty cows, 14 young cattle.

Diversity.—No per cent receipts from crops. Two important receipts: milk \$6,146, cattle \$393. One and one-tenth acres of crops per animal unit.

Production.—Crop yields: hay 1.5, alfalfa 2, oat hay 1. One hundred and twenty-three dollars receipts per cow.

Labor.—One year man, one 6 months, wife milks=3 men. Twenty-one acres crops per man. Twenty animal units per man. Twenty-one acres crops per horse.

NOTES.—Land value about \$60. Located in narrow valley with large proportion of land suited only to pasture and woods. Adjoins village, railroad and milk station. Milk prices averaged about \$1.85 per cwt. Growing season very short. Compelled to keep large dairy—no alternative for most of the farms of that region. Fifty cows and young stock not too many for pasture. This required 3 to 4 milkers. Only 64 acres available for crops which was not enough to keep 3 or 4 men busy between milking, so wife milked regularly. Problem in cropping system was to supply roughage for stock. No land for grain at all—not even for silage. Grain bill \$2,258, bedding \$80. Since the business was entirely dairy, it was vital that the cows be good. High receipts per cow on 50 cows handled as efficiently as conditions permitted resulted in a good labor income. Good organization is impossible under such conditions. The problem is to approach the ideal as near as possible.

1913 RECORD. CORTLAND COUNTY, N. Y., FARM

Labor Income \$4,458

Size of business.—Eighty-five acres in crops: 15 silage, 3 potatoes, 10 cabbage, 12 oats, 2 peas, 3 millet, 40 hay. One hundred acres pastured, including 25 in woods. Twenty-six cows, 15 young cattle.

Diversity.—Thirty-five per cent of receipts from crops. Four important receipts: cattle \$2,600, milk \$2,400, cabbage \$1,800, hay \$547. Two and one-tenth acres of crops per animal unit.

Production.—Crop yields: silage 10, potatoes 200, cabbage 12, oats 45, hay 2. Ninety-two dollars receipts per cow.

Labor.—One year man, one 2 months = 2.2 men. Thirty-nine acres crops per man. Eighteen animal units per man. Twenty-one acres crops per horse — 4 horses.

NOTES.—Land value \$100. Typical of valley farms. Short growing season, abundant rain. Level valley land well drained and fertile, especially adapted to cabbage. More than half farm is steep hillside pasture and woods. Crops on some of lower hillside in spite of steepness, because of need of crop land. Near railroad, milk station and cabbage storage house. Milk price about 3 cents per quart. Cows and young cattle, pure-bred Holsteins—enough for pasture. Enough silage for cows, rest of crop land in rotation that includes all cabbage can handle. Rotation: silage on sod, cabbage and potatoes second year, oats and factory peas third year, hay down 2 to 3 years. Organization as good as conditions permit. More crop land would improve diversity and labor efficiency, but it can not be secured. All farms lack crop land, there. Buying another farm would not solve this problem. Good cabbage prices made labor income higher than usual. This year (1915) with cabbage sold at \$4 the labor income is \$2,988.

1913 RECORD. CHEMUNG COUNTY, N. Y., FARM

Labor Income \$2,453

Size of business.—One hundred six and five-tenths acres in crops: 13 tobacco, 20 silage, 0.5 potatoes, 20 oats, 50 hay. Fifty acres pasture. Nineteen cows, 11 young cattle.

Diversity.—Forty-four per cent of receipts from crops. Three important receipts: milk \$2,626, tobacco \$2,338, cattle \$486. Three and four-tenths acres of crops per animal unit.

Production.—Crop yields: tobacco 1,798 pounds, silage 7, potatoes 120, oats 47, hay 1.5, apples 0. One hundred and thirty-eight dollars receipts per cow.

Labor.—One year man, one 6 months, day help 230 = 3.3 men. Thirty-two acres of crops per man. Ten animal units per man. Nineteen acres of crops per horse — 5.5 horses.

NOTES.—Land value about \$120. Conditions much same as preceding farm except that longer growing season makes tobacco raising profitable. Two miles to station. Milk price 3.5 cents per quart. Valley farm with considerable pasture. Enough cows, partly pure-bred, and young cattle to use pasture. Enough silage and hay for stock then oats enough for rotation of silage, oats, hay 2 to 3 years. Rest of land in tobacco. Tobacco on same land for several years, then changed. A well organized business.

1912 RECORD. TOMPKINS COUNTY, N. Y., GENERAL FARM

Labor Income \$3,321

Size of business.—Two hundred and forty-six acres in crops: 9 silage, 24 potatoes, 44 beans, 47 oats, 12 wheat, 110 hay. Twenty-six acres pasture, including 8 in woods. Twelve and five-tenths cows, 16 young cattle.

Diversity.—Seventy-three per cent of receipts from crops. Five important receipts: potatoes \$2,250, beans \$2,000, milk \$1,300, hay \$1,110, cattle \$670. Eight and two-tenths acres of crops per animal unit.

Production.—Crop yields: potatoes 250, hay 1.4, beans 24, oats 43, wheat 25. One hundred and four dollars receipts per cow from milk.

Labor.—One year man, one 10 months, one 8 months, day help = 3.8 men. Sixty-five acres crops per man. Seven and nine-tenths animal units per man. Twenty-three acres crops per horse — 7.5 horses.

NOTES.—Land value about \$80. Small proportion of land in pasture. Good potato and bean conditions. Five miles to railroad and milk station. Milk prices about 2.8 cents per quart. A few more cattle, pure-bred Holstein, than pasture would carry but not enough to require regular use of crop land for pasturing nor soiling which would not be justifiable, with milk price so low and a 15-cent hauling charge per can. Crop and stock balance not best but probably most profitable under conditions. Roughage worked down eventually. Marketing potatoes, hay and beans over 5 miles of dirt road furnished plenty of winter work for men and teams. Fertilizer used freely. Crop yields increasing. Excellent organization, everything considered. Labor income ranges from \$3,000 to \$5,000.

1911 RECORD. TOMPKINS COUNTY, N. Y., FARM

Labor Income \$3,782

Size of business.—One hundred and eight acres in crops: 2 corn, 24 silage, 1 potatoes, 2 mangels, 15 oats and barley, 9 wheat, 11 alfalfa, 35 hay, 4 sorghum, 4 apples, 0.5 peaches. Thirty-seven acres pastured, including 15 in woods. Twenty-nine and five-tenths cows, 18 young cattle.

Diversity.—Six per cent receipts from crops. Two important products: milk retailed \$5,936, cattle \$1,758. Two and three-tenths acres crops per animal unit.

Production.—Crop yields: silage 10.4, oats and barley 23, wheat 30, hay 0.7, alfalfa 4, apples 25. Two hundred and two dollars receipts per cow at retail prices, at wholesale prices would be \$76 per cow.

Labor.—Two year men, one 9 months, day help 10, son 1 year = 4.8 men. Twenty-three acres crops per man. Nine and eight-tenths animal units per man. Fifteen acres crops per horse — 7 horses.

NOTES.—Land value \$100. Located 1.5 miles from city of 15,000 population making retail milk business practicable. Son did retailing. Pure-bred Holsteins kept. The business had good size. Higher prices for milk, 7 and 8 cents per quart, and profit on pure-bred stock justified keeping more stock than pasture would carry. Silage fed through summer. Crop land devoted primarily to feeding stock. Though crop receipts were low, diversity was not entirely lacking. Milk production, milk retailing and raising pure-bred cattle gave some diversity. More crop land was needed, however, to keep labor better employed and to make more efficient use of manure. Low yields were due to extremely dry season. They are high usually. Since this record was taken an adjoining farm of about 100 acres has been purchased. An extra man for 8 months and 1 team have handled the additional land. Labor efficiency has been improved, more pasture is available and hay and wheat are sold.

1911 RECORD. MONROE COUNTY, N. Y., FARM

Labor Income \$4,110

Size of business.—Forty-seven acres in crops: 8.8 potatoes, 10 cabbage, 10 oats, 5 wheat, 8 hay, 5 peas. Two cows, 650 hens.

Diversity.—Fifty per cent of receipts from crops. Five important receipts: eggs \$2,231, cabbage \$1,670, potatoes \$788, poultry \$593, peas \$250. Three and sixth-tenths crop acres per animal unit.

Production.—Crop yields: potatoes 307, cabbage 15, oats 55, wheat 30, hay 1.5, peas 20. One hundred and forty-three eggs per hen. Three dollars and forty-three cents egg receipts per hen.

Labor.—One year man, one 3 months, family help = 2.5 men. Nineteen acres of crops per man. Five and two-tenths animal units per man. Eight acres of crops per horse.

NOTES.—Land value about \$150. Excellent soil and favorable climate. Adapted to general crops. All land tillable. Hens constitute stock end of business. Good balance. Intensive cropping system practiced making business larger than it first appears. Grain grown only for rotation purposes and straw. Most of grain for hens purchased. Land devoted to more profitable crops. Good cabbage prices that year. High egg production. Not a common type but one that has the essentials of good organization.

THE AGRICULTURAL LAW AS IT RELATES TO PLANT DISEASES,
FARM SEEDS, INSECTS, FOOD STUFFS AND NOXIOUS WEEDS

GEORGE L. FLANDERS

For the matter presented by Mr. Flanders, see copy of Bulletin
72, Agricultural Law 1915, accompanying.

Plant Diseases, pages 1897-1903.

Seeds, page 1917.

Insects, pages 1897-1903.

Feeding Stuffs, pages 1864-1868.

The laws pertaining to weeds are not a part of the agricultural
law, but of the town and county law, and are as follows:

LAW PERTAINING TO WEEDS

Page 337

Chapter 16 of the Laws of 1909 — County Law — being chapter 11 of the
Consolidated Laws.

Article III, Section 12 — General Powers

The Board of Supervisors shall:

1. * * *
2. * * *
3. * * *
4. * * *
5. * * *
6. * * *

7. Make such laws and regulations as they may deem necessary for the
destruction of wild animals and noxious weeds within the county.

Page 427

Article XV, Section 240 — County Charges

The following are County charges:

1. * * *
2. * * *
3. * * *
4. * * *
5. * * *
6. * * *
7. * * *
8. * * *
9. * * *
10. * * *
11. * * *

12. The sums required to pay the bounties authorized by resolution of the Board of Supervisors for the destruction of wild animals and noxious weeds, unless the supervisors by resolution direct that such bounties shall be town charges.

Page 4242

Chapter 63 of the Laws of 1909—Town Law—being chapter 62 of the Consolidated Laws.

Article IV, Section 43—Powers of Town Meeting

The electors of each town may, at their biennial town meeting:

1. * * *
2. * * *
3. * * *
4. * * *

5. Make provisions and allow rewards for the destruction of noxious weeds and animals, as they may deem necessary, and raise money therefor;

Page 3286

The Railroad Law, Chapter 39 of the General Laws

Article II, Section 53

Canada thistles to be cut. Every railroad corporation doing business within this state, shall cause all Canada thistles, white and yellow daisies and other noxious weeds growing on any lands owned or occupied by it, to be cut down twice in each and every year, once between the fifteenth day of June and the twenty-fifth day of June, and once between the fifteenth day of August and the twenty-fifth day of August. If any such corporation shall neglect to cause the same to be cut down, any person may cut the same, between the twenty-fifth day of June and the fifth day of July inclusive, and between the twenty-fifth day of August and the fifth day of September inclusive in each year, at the expense of the corporation on whose lands the same shall be so cut, at the rate of three dollars per day for the time occupied in cutting.

Section 54 of the Highway Law, as amended by chapter 151 of the Laws of 1911:

Section 54. Removal of noxious weeds and brush within the highways, and of obstructions caused by snow. It shall be the duty of the owner or occupant of lands situated along the highway to cut and remove the noxious weeds growing within the bounds of the highway, fronting such lands, at least twice in each year, once in the month of June, and once in the month of August. It shall be the duty of such owner or occupant to cut and remove all briars and brush, growing within the bounds of the highway, fronting such lands, once in the month of August in each year. It shall also be the duty of such owner or occupant to remove brush, shrubbery and other obstructions within the bounds of the highway, causing the drifting of snow upon said highway, before the first day of November in each year. If such owner or occupant fails to cut or remove such weeds or brush, or to remove such brush, shrubbery or other obstructions, causing the drifting of snow, as provided herein, the town superintendent of the town in which said lands are situated shall cause the same to be done, and the expense thereby incurred shall be paid in the first instance out of moneys levied and collected and available therefor,

and the amount thereof shall be charged against such owner or occupant, and levied and collected, as provided in section fifty-five. The town board of any town may, by resolution, determine that the work required by this section to be done by the owner or occupant of lands situated along the highway shall be done by the town superintendent. If such resolution be adopted such work shall be done by the town superintendent at the times prescribed by this section, the cost thereof shall not be charged or assessed against the owner or occupant but shall be a town charge, and there shall be annually raised in such town in addition to other moneys raised for highway purposes a sum sufficient to pay such expense.

THE PASTEURIZATION OF DAIRY BY-PRODUCTS IN NEW YORK STATE

W. D. DOTTERRER

Bacteriologist, New York State Commission for the Investigation of Bovine Tuberculosis

The work summarized here is the result of an investigation undertaken under the direction of the Bacteriological Department of the New York Agricultural Experiment Station on the methods, efficiency and effects of pasteurizing dairy by-products. In the course of the investigation visits were made to seven American cheddar factories and one skimming station where pasteurization was being carried out. According to the 1915 report of the New York State Department of Agriculture there are about 950 cheese factories in the state. Of these, forty-eight are definitely known to be pasteurizing the whey. Twenty-four of the latter make American cheddar, thirteen make Swiss, nine make limburg and two make brick cheese. At only one of the factories visited were the temperatures used in pasteurization high enough to meet the lowest temperature (178°) usually required in those states which have laws on the subject, and at this factory such temperatures were reached only occasionally. The Pennsylvania law requires 178° F., Iowa 185, Minnesota 180 and Michigan 185, with the option of 145 for thirty minutes. All of the factories except two, however, were using temperatures high enough to meet the requirements of the option allowed by the Michigan law. These two factories were also losing a great part of the value of pasteurization by adding separator slop and water after the whey was too cool to kill bacteria. One other factory followed this same practice so that pasteurization, which otherwise would have been effective, was rendered unsatisfactory.

The temperatures necessary to kill disease germs have been studied by a number of men. The work has been summarized by Rosenau,* who verifies the conclusions by work of his own. As low a temperature as 140° F. for 20 minutes has been found to

* Rosenau, M. J. The Thermal Death Point of Pathogenic Microorganisms in Milk. U. S. Public Health and Marine Hospital Service, Hygienic Laboratory Bul. 42, 1908.

render tubercle bacilli unable to produce tuberculosis, but this margin of safety is narrow. A temperature of 178° F. will kill disease-producing bacteria almost instantly, and when whey is held at that temperature for some time there is a wide margin of safety. This temperature also produces chemical changes in the whey which are detectable by the use of a simple chemical test.

In addition to destroying disease-producing bacteria, pasteurization greatly improves the feeding value of whey by killing yeasts and bacteria which produce undesirable changes in the whey. Pasteurization prevents the separation and consequent loss of butter fat, and saves a large part of the milk sugar that is lost by souring in unpasteurized whey. There is a feeling that pasteurization of whey improves the quality of cheese because the patrons' cans are not seeded with undesirable bacteria when taking whey back to the farm. At the places where pasteurization is in use, neither the cheese men or the farmers would be willing to discontinue the practice.

Practically the entire bacterial flora of pasteurized whey was found to consist of *Bacillus bulgaricus*. This is the long rod form of lactic acid organism. The ordinary sour milk bacteria are short rods or even spherical in shape. *B. bulgaricus* develops in large numbers in the warm whey as it cools over night, but never produces as much acid as it would if the whey were not pasteurized. A single examination of unpasteurized whey from a tank that had the appearance and odor of an old swill barrel showed *B. bulgaricus* predominant, but mixed with a large number of yeasts and other organisms. This unpasteurized whey had an acidity three times as great as that of pasteurized whey, and the fat was all on the surface. The fat accumulated from day to day and formed a dirty sour mass, which was never cleaned out of the tank. Under such conditions the pasteurized whey has a greater feeding value than unpasteurized whey.

The results of this investigation indicate that the best way to pasteurize whey is by introducing live steam directly into the storage tank, either with or without the use of a steam jet pump for drawing the whey from the vat. Four of the factories visited were securing satisfactory pasteurization, and all four were using direct steam in the tank. Double jetting can not be relied upon

to give sufficiently high temperature to pasteurize under ordinary factory conditions. However, if the cheesemaker is inclined to be negligent, the double jetting system is more likely to be used consistently.

The investigation of skim milk pasteurization was not extensive enough to warrant definite conclusions. The one skimming station visited was not securing satisfactory results because too low temperatures were used.

The cost of pasteurizing whey has been found to be between one-half cent and one cent per 100 pounds of whey.* One manufacturer operating thirteen factories was found who charged five cents per 100 pounds of cheese. This is approximately one-half cent per 100 pounds of whey. Another manufacturer charged one cent for each 100 pounds of whey.

Further information on the subject of pasteurizing dairy by-products may be found in the following publications: Hearn, Frank and Publow, G. G. "Notes on Cheddar Cheese Making," Ontario Dept. of Agr., Dairy Branch, Bul. 183, 1910; Farrington, E. H. and Hastings, E. G. "The Pasteurization and Inspection of Creamery and Cheese Factory By-products," Wis. Exp. Sta., Bul. 148, 1907; State Livestock and Sanitary Board, Commonwealth of Penn, Circ. No. 28, "Pasteurization Device for Use in a Creamery," and Circ. 31, "Pasteurization of Skimmed Milk," Rept. of the Third Dominion Conference of Dairy Experts, Dept. Agri., Ottawa, 1911; Russell, H. L. "The Spread of Tuberculosis through Factory Skim Milk with Suggestions as to its Control," Wis. Exp. Sta., Bul. 143, 1907; the Rept. of the N. Y. State Commission for the Investigation of Bovine Tuberculosis, 1915.

A bulletin is being prepared for publication by the N. Y. Agriculture Experiment station which takes up more fully the discussion of the work summarized here.

* Ont. Dept. Agri., Dairy Branch, Bul. 183, 1910.

PRIZE ESSAYS

In order to secure matter of the highest character on the subjects of Farm Management and Crop Rotation, Commissioner of Agriculture Wilson and Director of Farmers' Institutes van Alstyne offered a prize of a pair of gold link cuff buttons inscribed "Normal 1916" for the best essay on each of the above topics.

The essays were to be judged on the scale of 60 points for practical, helpful information; 20 points for logical arrangement, and 20 points for literary style and English; and were to be prepared in advance under a nom de plume and submitted to the committees, who should announce their findings at the meeting of the Normal on Friday evening.

The committee for the manuscripts on farm management consisted of Dr. George F. Warren, Professor Chas. H. Tuck, and Professor D. J. Crosby, who awarded the prize to Mr. Jared Van Wagenen, jr., of Lawyersville, Schoharie County.

The committee for those on crop rotation was made up of Mr. M. C. Burritt, Director of Farm Bureaus; Senator Thomas B. Wilson of Ontario County, and Mr. L. A. Toan, Farm Bureau Manager of Monroe County, who awarded the prize to Mr. D. P. Witter. The articles, which follow, were read by the authors, and the prizes awarded as above.

FARM MANAGEMENT

JARED VAN WAGENEN, JR.

Farm management may fairly be called one of the oldest of arts, and yet one of the newest of sciences. As long as men have followed the calling of the husbandman, each farmer has more or less successfully dealt with the principles of farm management. The first pastoralist proved himself a good farm manager when he led his flocks where the pastures were greenest; and our grandfathers on New York State farms, perhaps less trained than we in books and with less of written knowledge to guide them, were nevertheless farm managers and oftentimes very successful ones. But it is only within recent years that this new science has been so developed that men have put its findings into books and that certain principles have been proven by survey work and put into teaching form. Let us emphasize the fact that we are not dealing with anything fundamentally new. We are rather trying to arrange and codify long established principles and farm traditions.

I confess that it is not easy for me to define or limit the domain belonging to this science. There is certainly not an agricultural operation or practice which is not touched by it. For example, the selection of a ration for a cow which shall enable her to give the largest possible production of milk may be, taken solely by itself, a question merely of animal husbandry, chemistry and nutrition; but, just as soon as you begin to consider matters of relative food costs or of markets, then farm management comes into the problem. So crop rotation may be a practice controlled by considerations of climate, soil adaptability, insect enemies and plant diseases; but just as soon as we begin to consider one crop in its relation to other crops so that there may not be interference in planting or harvesting, or to plan so that there may be a succession of work throughout the season or that certain markets may be supplied, then we are dealing with factors of farm management.

Still, a brief discussion such as this certainly cannot cover the entire field of agricultural practice, and it must draw a line somewhere. Let us say, then, that farm management concerns itself

with questions of business methods and administration as distinguished from technical agricultural practice. This distinction is by no means sharp or clear, but it will perhaps do for a starting point. This at least is true — that it is not easy to overestimate the importance of the study of the principles which underlie the successful conduct of a farm business.

We look about us in the farm community and we see some men running behind with the years. We see others just about holding their own, and here and there a man making a rather conspicuous success. It is worth while to inquire in a scientific spirit the reason for these things. It is not always — as we may have assumed — because the unsuccessful man is less industrious or sober or economical or even less intelligent. It may be because of fundamental errors or circumstances or business methods. There may be circumstances that fatally handicap even good men, and our farm surveys are giving us a great mass of data that throw light on these things. It is true that men fail because they are lazy or ignorant or generally incompetent. Unfortunately, it is also true that they fail for causes of which they themselves have a very hazy notion and which seem beyond their control — perhaps because their business is too small or because they are following a type of farming unsuited to their locality or because of lack of what, in larger affairs, we call executive ability. What shall we say about all these things?

I believe that the discussion of farm management properly begins with the man himself. Thomas Carlyle — that sturdy Scotch prophet — gave to the world a new beatitude when he said "Blessed is the man who hath found his work," meaning thereby, "Happy is the man who hath found the task in life for which he is adapted." There is no time here to discuss the many personal qualities which go to the making of a good farmer. But he must at least be farm-minded. He must have aptitude for farm affairs and, ordinarily, willingness to do manual labor. It ought to be emphasized for the benefit of the city man and the "Back-to-the-Lander" that, except in special and extensive farm operations, the owner cannot expect to give his entire time to executive and office duties. An annual business of two or three or even five thousand dollars in the city would not support a man whose duties were

purely executive. No more will it do so on the farm. This is by no means denying the frequently repeated assertion that farmers work too hard with their heels and not enough with their heads; yet, most of us must continue to illustrate the truth of the homely saw,

“He who by the plow would thrive
Himself must either hold or drive.”

It is not necessary that a man be born to the farm. I have known several men who began life as school teachers and afterwards made good as farmers to a rather marked degree. But this at least is most essential — that a man have the farm point of view and find comfort and satisfaction in country things..

One of the important factors in successful farm management is the size of the business. Most of us have heard and fully believed the old rhyme which extols the blessedness of

“A little farm well tilled,
A little barn well filled,
A little wife well willed.”

Rigid investigation and farm surveys have demonstrated that, however undebatable the last line the other two are only half true. The most prosperous farmers — the ones who are making the best income — are those who are farming it in a fairly extensive way. Of course it must be noted that it is the size of the business rather than the number of acres that interests us. A man with two acres of onions and an equal area of strawberries and celery may fairly be called a bigger farmer than the man with two hundred acres divided between hay, oats, buckwheat and pasture. Just so the man with a quarter of an acre under glass will be doing a rather extensive business. The amount of labor used beyond the owner himself is perhaps the best single measure of the size of a business. I feel like laying emphasis upon the fact that to learn to employ successfully and profitably the labor of other men is one of the prime requisites of good farm management.

Most farming should work toward fairly large units, not only of business but of area. Not all of us can become growers of garden truck or small fruits or flowers under glass. The typical

agriculture of the world where most of us will find a place will be general farming — dairy, pasture, cereals and hay. With this type of farming, a man will not buy automobiles or send his sons to college or maintain a very high standard of living on forty acres. He may do all these things on — say 200 acres, even with a rather general and non intensive type of agriculture. But if he has only forty acres it becomes his duty to do one of two things — either to rent or buy more land, or else to adopt some special intensive crops suited for small areas.

Our commonly accepted ideas concerning the advantages of small highly tilled farms will not stand the test of analysis. Ultimately in America we shall approach the European ideals of intensive agriculture, but not until both land and products are higher in price than now. Other countries produce much more food per acre than we, but no other land approaches us in the amount of food produced for each man employed. Our system is the best economy for the present at least.

Of course, mere bigness of area is not in any way a guarantee of success. The four hundred acre farm needs a four hundred acre man to manage it, but with the right kind of control it has far greater possibilities of profit than the little "place." To employ a man and make him produce an amount in excess of his wages is good business. The fact that a good sized farm permits the employment of men beyond the owner and his family is only one of its advantages. There is much machinery — binders, corn harvesters, manure spreaders, potato diggers, hay loaders — where the investment will be larger than is justified upon the small farm, but which can properly be made a part of the invested capital of the larger farm. So, too, horses — always one of the most expensive factors upon the farm — are usually employed more steadily and efficiently upon the larger areas.

The man on forty acres will hardly be able to get along with less than two horses; but the man on 200 acres will hardly feel the necessity of keeping ten. An idle horse is an expensive luxury that ought to drive us to earnest thought on the subject.

On the other hand there is surely a limit to the best size of a farm. Bonanza farms have not tended to remain intact. Great holding of land with superintendents and a peasantry brings in

bad social conditions, but any such general system is very far off in America. Farms that run into thousands of acres outgrow the ability of any one man to keep in touch with all the operations, and I believe that, owing to uncertainties of weather and many other things, they cannot be administered by captains of industry as can our great corporations — for which I am very thankful.

To state the proper size for a New York State farm is entirely impossible. It will vary with the size of the man. It will be bigger in the general farming regions of the state than on the intensively farmed areas of Long Island. If the farm is too large and there is only one set of buildings, the distance for hauling crops and manure becomes too great for high efficiency. Perhaps because I happen to be accustomed to that size I think of 200 acres as a very desirable unit.

Another factor in good farm management is the diversification of crops. It is the fashion to extol the virtues of specialization, and it is possible to point out specialists — onion growers, hop growers, truckers and others — who have given most of their attention to only one or two crops and have been wonderfully successful. Nevertheless, in the long run it is the man with several irons in the fire who stands the best chance of winning. New York State farms are generally pretty well diversified. It is true there are very many farmers who sell milk and a little stock and practically nothing else; but dairying makes use of so many crops, and its operations are so continuous throughout the year, that it can hardly be put in the same category as some other one-crop farming. Even so, the dairyman might be better off if he would add some other crop to be grown on the side — say potatoes if he happens to be on the proper soil, or perhaps fruit. Almost always he ought to expect to sell No. 1 timothy hay.

Diversification of products is an insurance against the lean years that come to every crop and farm. In addition, it permits a more uniform labor schedule throughout the year, and hence more satisfactory conditions for the hiring of men. It has also an important bearing upon the question of horse labor. The man who sows only spring crops uses his teams in April and May, again in July and August, and then for fall plowing in October and November. If he grows a crop of buckwheat he can use them in

June, and if he puts in winter grain they may be profitably employed in August and September. It would be easy to multiply examples of the advantages of diversification. I believe in one strong line as a specialty with several side lines. I take considerable pleasure in thinking that at home we produce almost everything suited to our soil and climate. More than one-half of our income is from the dairy; yet we habitually sell timothy, hay, rye straw, rye and buckwheat, apples, small fruits, a variety of truck crops, pork, lambs and wool. I emphatically believe this is sound farm practice.

Another most important consideration of farm management is the type of farming to be followed. This will vary with the soil, climate, topography and markets. On Long Island you will find exceedingly prosperous farmers growing truck on land worth \$250 per acre and using condensed milk on their own tables. I believe they are right in this because their lands have special adaptability to certain high grade crops, but is not as well suited to cow keeping as upstate lands at one-fifth the price. Generally, the established agricultural practices of any community are fairly sound; yet we do find men patiently trying year after year to grow potatoes as a money crop on heavy clay land when they ought to abandon the crop and try cabbage or timothy hay instead.

Sometimes the markets rather than soil or climate is the determinant factor in crop selection; for example, we grow asparagus on soil not well adapted to the crop, but we have exclusive control of the local market and therefore it pays us. It would be folly, however, for us to attempt to grow it and market in the big centers of distribution.

In a word, we must lay the main stress on the crops which, either by natural adaptability or by special market requirements, are best suited to our conditions.

Farm management must also deal with the question of how much capital ought to be invested in buildings, improvements and implements. Good old Professor Roberts loved to tell his classes that, when a farmer had made a hundred dollars, it was often much wiser to "bury it in the ground"—meaning thereby drainage—than to put it in the bank. The same is true of purchased fertility and improved implements. There are very

many needed farm expenditures that ought to return a larger interest yield than any other possible investment. We may remember, however, that funds locked up in these forms are not quickly collectible. They do not constitute what bankers call "liquid assets." This is only saying that in good farm management it is wise, if possible, to have at least a working cash balance large enough to provide for emergencies and to enable us to take advantage of sudden or seasonal variations in the price of supplies or feeding stuffs. It is wise also to invest in stabling and buildings that are convenient, sanitary and at least creditable in appearance; but most so called model barns cost altogether too much per head of live stock accommodated, and in addition are very frequently models of poor construction and unintelligent planning.

It is a favorite idea of mine that some day we shall replace our permanent fences and field outlines with temporary woven wire, which shall be hung on light, well sharpened posts and moved about from year to year as convenience may require. There is really no particular use of sticking to the outlines of a field because originally grandfather happened to fence it in that particular shape. There is a big opportunity to make over the layout of most farms.

Drainage, building and fertility must be bought, for they do not belong to the class of things that may be hired; they represent fixed and indispensable investments. This is not always true of some implements. More and more I am coming to believe that if a machine is to be used only two or three days during the year and can then be hired at a reasonable price, it is rarely economy to buy. Much of our machinery is outclassed in design, although by no means worn out, after ten years. At home we have owned our own silo filling outfit for twenty years. We now hire our silo filled by the hour, and we shall not purchase another rig. On most machines the interest on the original cost plus depreciation will aggregate at least 15, and generally 20 per cent.

The foregoing are some of the most evident factors in farm management but there are many others.

The questions connected with the hiring and handling of farm labor are ever to the front.

The breeding, and especially the exploiting and marketing of pure bred stock, is quite as much a part of farm management as of animal husbandry.

The question of land values and the rental of lands is of especial importance in certain localities.

The laying out of the farmstead; that is, the arrangements of the fields, fencing, roads and buildings, with reference to soil, highways, hill and dale, forest and stream and hamlet, is one of the most important of all.

The farm home itself is a matter of farm management as well as of architecture.

Finally, the whole subject cannot be learned solely from books nor can it be made to conform strictly to any written rules or principles. Very largely it must be made by every man on his own farm to fit his own particular conditions.

ROTATION OF CROPS

D. P. WITTER

Plants do their feeding out of sight, and the process of plant growth is always surrounded with mystery; yet, the persons who observe closely may, by their study, learn much of the laws and needs of plants.

They will find some plants which have roots that feed near the surface, while others like alfalfa, or even corn and red clover, send their roots down deep in the earth, if they find a congenial feeding ground. They will find other plants which require large amounts of nitrogen, such as corn, and still others which require much smaller amounts, like potatoes. What is true of the nitrogen requirement of plants is also true of potash and other minerals.

Some plants have the ability to feed and prosper on plant food which would be locked up and unavailable to other plants. Some plants have small seeds and, to start growth well, require considerable plant food already available; while other plants may live for some time on the nourishment found in the seed, and do well when only a small amount of plant food is ready for assimilation. Some plants feed largely from the air, while others depend to a greater extent upon the soil for their nourishment. Some plants, such as rye, wheat, oats, and barley, germinate at a low temperature, and so do best in cool weather; while such plants as corn and cucumbers will not germinate except when the weather is moderately warm. Some plants will stand severe freezing, live all winter and start to grow early in the spring; while others must be matured before frost comes or they will be destroyed.

Some plants make a happy feeding ground for certain insects, or fungi; while on other plants the same enemies would die for want of food and congenial conditions. Weeds will flourish well with some plants, while with others they would scarcely survive. Thus by a proper rotation of crops, the elements of plant food are kept in a more even balance, the fertility of the land is more

easily maintained, and insect pests and plant diseases are reduced to the minimum.

As an argument for the rotation of crops on the farm, we have not only the great variation in plants, and the better condition of the soil, but the better distribution of labor and the advantage of having several sources of income—all of which are very important.

With sharper competition, higher priced land, labor and seeds, the farmer is confronted with diminishing profits as the years go by; and he can succeed only by meeting those changing conditions with the best employment of labor during the entire year, and securing the largest possible income from the farm, which is usually derived from several different sources.

There can scarcely be anything more demoralizing than for men to be employed for eight or nine months, and to live in idleness the remaining months of the year. From the standpoint of economy, efficiency and morality, the farmer should give his help employment the full twelve months of the year.

Let us feel now that from every standpoint we have proven that a rotation of crops on the farm is a wise practice.

What shall the rotation be? To answer that question we have many problems to consider—the soil, seasons, markets, and the man himself.

The wise farmer will carefully study the nature of his soil, and grow only such plants as will thrive best with him. The adaptation of plants to soil is ever a problem with the true farmer. The soil in some parts of Florida, which is not a soil but almost clear sand, is very valuable for the production of pineapples, but is worthless for the growth of wheat. In New York State the soils are so mixed that, not only on every farm but almost on every acre of land, soils may be found which would be classified very differently.

It is very fortunate that, while we have such a variety of soils, we also have many plants which thrive well here and can be grown successfully on soils of different composition, and the farmer is therefore given quite a wide range of plants from which to make his selection.

The seasonal and climatic conditions surrounding the farm must play an important part in the selection of any given rotation.

The market to which farm produce must be taken should be carefully studied; for surely no wise man would grow crops which he could not profitably market.

Before the farmer makes his choice of the crops he will grow and the rotation he will follow, he should make a very careful study of himself. Conditions must be terribly out of balance if a farmer succeeds in any line of farming which he does not like. For greatest success the farmer must be in love with the line of work he attempts to follow.

If a man will carefully study his farm, climate, markets and his own likes and dislikes, he alone may be the best judge of the kind of plants and the length of rotation which will be best for him to adopt.

A few examples may be given and reasons therefor, which will be helpful to some farmers. Let us consider a farm of two hundred acres located in Southern New York. There are portions of the farm which are wetter, steeper, or further removed from the barn, than other portions. Those lands may well be put under a long rotation, and the lands which are dryer, more level, and closer to the buildings may be put under a short rotation.

If such a farm carries a dairy, the lands which are wet, steep, or far removed from the barn may be seeded with a mixture of red and alsike clover, timothy and redtop. They may remain in meadow for several years and produce well, if top-dressed occasionally with manure or commercial fertilizers, or both. It would be a wise practice to keep such land in grass as long as good paying crops of hay can be secured from it annually. The grain crops on this portion of the farm may be buckwheat, followed with rye, the above grass seed mixture being used to seed with the rye.

On the land better adapted for cultivation, a three- or four-year rotation may be adopted. If the land needs drainage it would be economy to lay tiles so that a regular rotation could be followed without interruption from too much moisture, such as we have had the past season.

The rotation which will best meet the conditions under consideration may be made up in several different ways. If the land suitable for tillage is limited, a three-year rotation is best, and may be made of clover, corn and oats. If enough land can be used for cultivation to permit, and it is desirable to grow potatoes as a cash crop, a four-year rotation may be adopted, made up of clover, corn, potatoes, and oats. This is a very common rotation in southern New York and can scarcely be improved upon, if the soil and market conditions are suited for it. If a four-year rotation is desired and potatoes are not wanted, the rotation may be corn, oats, and grass two years, the second year of grass being used as a cash crop.

Through the central portion of the state where dairying is not extensively carried on, and where the soil is well adapted for the culture of alfalfa, beans, wheat and other cereals, an entirely different rotation will be found best. Alfalfa is not generally used in a rotation, but it is often used as a cash crop and should receive mention.

A good rotation under such conditions may be clover, corn, beans and wheat. Clover is an excellent crop to grow before corn or potatoes. Beans will follow corn well, and wheat after beans does not require plowing the land, which is a saving worthy of consideration. On such farms animals are not usually kept in large numbers, and the amount of manure made is not sufficient to keep up the organic matter in the soil as it should be. In such cases the farmer should resort to green manuring. For that purpose, twenty pounds of winter vetch seed sowed in each acre of corn just before the last cultivation, and plowed under in the spring, will fit the land well for beans. If desired, potatoes or cabbage may follow corn instead of beans. In some cases the rotation may better be clover, corn, oats and wheat.

In many cases wheat or rye may be used to seed with instead of oats. Oats require so much more water to bring them to maturity than most other plants, that if the season is dry, and they are allowed to fully ripen, the young grass plants are apt to die for want of moisture. Barley has not been mentioned, but it is a good crop to grow and seed with, and may take the place of oats in the rotation. More plant food is needed to grow the average crop

of barley than of oats, but it does not require more than three-fifths as much water to mature the crop and it may be matured in the hottest weather, which gives it another advantage over oats under some conditions.

One of the most profitable rotations practiced in this state, but not extensively followed, is clover, potatoes and wheat. This rotation may be carried on with one plowing; but, as thorough cultivation is essential to good farming, it may not be the best practice. Potatoes feed deep, and but little from the surface of the land. The cultivation which good potato culture demands sets plant food free in considerable quantities. When the land is not plowed before sowing to wheat, this crop gets the available plant food readily. Wheat does best on a firm seed bed, which is another argument in favor of this practice.

In the northern portion of the state, wheat and beans cannot be grown very well, and smaller varieties of corn must be grown than farther south. Potatoes and oats, which are both cold-blooded plants, thrive well in this latitude and should be extensively grown. The practice of growing winter vetch in oats, especially in this section of the state, is rapidly on the increase; and but for the high price of seed would be more generally used. Many farmers are now growing their own seed, which will tend to encourage its more general use. Vetch sowed with oats, at the rate of ten or twelve pounds of vetch seed and two bushels or less of oats to the acre, will add to the value of the straw, making it about equal to mixed hay. The vetch will live over winter and make a good crop to plow under the next spring, if the land has not been seeded to grass. If the land has been seeded it adds to the bulk and quality of the hay.

In the Hudson River valley soy beans are a valuable plant in the rotation, many times taking the place of oats. They probably will not be extensively grown in this manner except in the warmer portions of the state. When grown with corn to be put in the silo they are a very valuable plant and may be successfully grown in any portion of the state, if the right varieties are planted.

Legumes should be used in the rotation whenever practicable. Their value as soil builders is well known and they furnish a food richer in protein than any other plants.

One vital principle in crop rotation which should be held uppermost is often forgotten. The great need of most of our cultivated lands is for more organic matter. The farmer should always remember that the more often he can turn down heavy sods the greater amount of organic matter he is adding to his land, which means that a short rotation is better for the land than a long rotation, unless he is making use of manure or cover crops extensively.

It is claimed that over two hundred different kinds of plants are grown and marketed in New York State every year. It would be impossible to give all of this great number a place in some rotation; but, if the farmer will study carefully the suggestions mentioned in this paper, and knows the laws which govern the plants he wishes to grow, he will arrange a rotation best adapted to his conditions and will reap a rich reward for his labors.

REPORT OF THE WOMEN'S SESSION

THURSDAY

Mrs. Harrington presiding.

Mrs. Harrington introduced Director van Alstyne, who expressed his interest in the opportunity for women's work, stating that the outlook was most hopeful.

In addition to the man correspondent for each institute a lady correspondent has been selected. This has been most favorably received in all counties, only two women having failed to respond. Director van Alstyne read the following letter which he had sent to each lady correspondent:

MY DEAR MADAM.—When I notified you of your appointment as lady correspondent for your coming Farmers' Institute, I said I would write you later relative to your duties. I am sure you will not find them unduly arduous. They will be —

First: To interest the people in your community in the institute as a whole by bringing it to their attention before the meeting. Different ways of doing this will readily occur to you, but I suggest particularly by personally speaking of it to individuals; by bringing the matter before your grange or any other organization which may be in your community; by interesting your teachers and preachers and whenever possible getting them to give public notices of the meeting and the program, which you should receive at least a week in advance; and by seeing that your local papers call attention to the matter.

Second: By cooperating with the gentleman correspondent in seeing that he secures a suitable place for the regular sessions properly warmed and lighted, and a pleasant room for the special women's meeting. If you will send me the name of this room at least a month in advance, I shall insert it in the program.

Third: I shall have the lady who will attend your institute communicate with you. Write her freely, at this department, concerning the needs of your community, what subjects you would like discussed, and, in short, anything which will help her to serve you.

Fourth: The strain on men and women engaged in holding institutes, continually on the move, is very great. You will do much to aid them if you will see that they have comfortable places to stay. This is particularly important when the hotels are poor or there are none. If the speakers are fed at the hall, you will add much to their ability to serve you if you will provide a place where they may rest between the afternoon and evening sessions.

Last year we held 288 special women's sessions, with a total attendance of 12,043. I shall be disappointed if, through the efforts of our lady correspondents, our institutes are not better and the attendance much larger this season than ever before.

Very truly yours,

EDWARD VAN ALSTYNE,

Director of Farmers' Institutes.

Mr. van Alstyne asks that, so far as possible, reports of the conditions in the local towns be filled out, as he sends these reports to the lady lecturers to aid them in preparing for the coming institutes.

Dr. Heaton suggested the difficulties in the report relative to the local schools, asking if it would be necessary that every local school be visited. Mr. van Alstyne said that it was desirable wherever feasible, but that it was also desirable to prevent the students coming to the institute in a body; that it would be far better to talk to the pupils in the school, determining whether or not the school has medical inspection, definite instruction in nature study and moral training. It was decided that the greatest benefit which the farmers' institute women could be to the rural school was to give the rural school teacher a vision of the possibilities of her work.

The question was asked: Shall the subjects of the afternoon talks in the women's session be published? Although this is optional, it is desirable to state the subjects on the program, also to state on the poster that home economic subjects as well as agricultural subjects be included in the question box.

The next question to be discussed was given by Mrs. Harrington: What are we as women of the farmers' institute lecture force going to stand for during the coming year? Mrs. Jones gave her ideas that first and foremost the women should stand for the home as the center of all activities; that sanitation of the home, and practical and more efficient work in the home should be especially emphasized, efficiency to be obtained through systematic planning of the work, more careful buying and better selection of materials; that fads and untried theories are to be avoided. Director van Alstyne suggested that where a theory has been found to be worth while it is desirable that it be commended. Dr. Heaton expressed her belief that the women should stand for better health in the communities, stating that there is a higher death rate and more sickness in the country than in the city. The women of the institute should stand for better care of children, instruction in home nursing, good music, nature study, recreation, better domestic architecture and decoration, and most important — a water supply for the home and a system of sewage disposal. The septic tank, when properly installed, is the best means for the disposal of sewage at the present time.

Mrs. Morgan emphasized the need for the women to stand for culture. She stated that many letters come to her yearly from the women of the state asking what they can do to give their daughters culture. She suggested that the women speakers of the institute be not afraid of expressing egotism.

At the afternoon session a mock institute was held, Mrs. Harrington presiding. Those present discussed various questions on the question sheet. It was decided to appoint a committee for revising these sheets; Dr. Heaton and Mrs. Phelps were appointed.

Miss Knowlton of the Home Economics Department of the New York State College of Agriculture discussed the subject of how to present ventilation. She emphasized the necessity for simplicity in presenting those conditions with which they are familiar and simple means for remedying poor ventilation. She gave suggestions for avoiding drafts and emphasized the necessity for making people comfortable in cold weather by the use of warm beds, light covers and warm night clothes. She recommended that a drum be used on the stove pipe to utilize the waste heat from the stove below. Satisfactory drums can be purchased for from \$3.00 to \$5.00.

Comparative costs of heating ventilated and unventilated rooms were discussed, also the relative costs of heating a ventilated house, and the doctors' bills often accruing from unventilated houses. Emphasis should also be placed on the ventilation of grange halls, churches and schools. A health league may be formed among the women in the rural communities to create interest for better ventilation.

Dr. Heaton discussed the subject of ventilation, giving as her definition of fresh air that it was clean air in motion. In order to have the necessary warmth in a country house during the winter she advised that a double window be used, the outer one being hinged at the top so that it can be readily opened from the bottom. A flue for the intake of fresh air from without is easily utilized. A fireplace is a splendid means of ventilation provided there is a fire or even a burning lamp therein.

Dr. Santee cited the case of a school which boarded up the intake that supplied the fresh air to the schoolhouse. For one and one-half years sickness prevailed among the school children.

When this condition was remedied the health became better and it was found that it cost 7 per cent less to heat the fresh air than the impure air. He suggested that muslin curtains on a lath frame be used for a school room.

The question of the septic tank was then discussed by Professor Ogden and Dr. Santee. Professor Ogden stated that the suspended solids in the sewage settles out with a greater or less degree of rapidity, depending on the size of the solid particles; that 30 per cent. will never settle. In a tank having a capacity for 24 hours sewage, 60 per cent of the solids will settle. The effluent contains all organic matter in solution and one-half of that which is not settled out in suspension. One cannot state positively that disease germs are destroyed in the septic tank. Usually disease germs die quickly in the presence of putrefactive bacteria. Dr. Santee suggested that 48 feet of pipe should be used for the disposal of the effluent; that the tiles used be not too heavy and laid almost level — $1/32$ of an inch to a foot; that eight feet should be allowed per person in sandy loam and double that in light clay. Care should be taken that the pipes be laid near enough to the surface so that the effluent receives the action of the bacteria in the soil.

Dr. Matzke, resident physician for the young women of Cornell, next addressed the women. She emphasized the need for kitchen stability. She stated that women who are in the habit of doing their work in a hit and miss way in the kitchen will follow that same method in giving medicine. Better health will be obtained by simpler clothing, more sunshine, the proper use of blinds and shades, and cleanliness. She especially emphasized the needs of the sick room; that its furnishings should be simple and washable, without dust catchers; that the supply closet should be kept full; that no shades should be used so that plenty of sunshine can come in, and that in case of sickness nursing is half the battle. She advised that practical demonstrations in bed-making, bandaging and caring for the sick be included in the programs for the farm women, and that emergency cases be available to the farm women of the various communities.

FRIDAY

Mrs. Harrington presiding. Mrs. Harrington introduced Professor Rose who presented the work of the department of home

economics of the State Agriculture College. There are two courses — a regular four-year course leading to the degree of bachelor of science, and a three-months' short course. The first course requires regular college entrance credits; the second is open to all young women of the state. Miss Rose outlined the possibilities in making this department of even greater benefit to the women of the state.

Miss Van Rensselaer presented the three types of extension work which the department of home economics is now doing. First, the Cornell Reading Course Clubs organized throughout the state for the study of home problems. These are under the direct supervision of the department, which furnishes programs and bulletins for use in these clubs. Second, the department conducts extension schools in home economics, either in connection with the agricultural schools for men, or in communities which have no schools for men. It is necessary for each community to pledge the support of twenty-five women at a fee of seventy-five cents each for five days' work. The department also conducts junior extension schools in connection with the rural schools of the state. Canning clubs are formed among girls and breadmaking contests are conducted. When these products are judged the conditions which decide the score are explained to the contestants.

Miss Nye told further of the work of the junior schools. There are two courses, the first with the high schools to create a permanent desire for home economics in their schools, and the second in the rural schools with the teachers in conference to discuss the means of taking up home economics as a home project.

Mrs. Monroe took up the subject of better farm homes, expressing her belief that the contests which are conducted by the home economics department are a means of improving home conditions and that an increase in the income is also important. She therefore suggested that means of making money at home be brought to the attention of the girls on the farm.

Mrs. Jones said that she believes that the best civilization has come from the farm homes; that some of the best educated men and women have been reared on the farm; that the homes on the farm are imitating too much the city homes and that in the rush of every day life better living is lost sight of; that the boys and

girls should be taught to love the things at hand and not those things which are not obtainable. She believes that the essential factors to better farm homes are: first love; second, truthfulness; third, attractiveness; fourth, reverence for the parents, the aged and for God. She particularly brought out the fact that fathers and mothers are too busy to give comradeship to their children.

At the afternoon session Cornell instructors were present to take up the questions which the institute workers wished to ask.

QUESTIONS

"What are the advantages of hard and soft water for drinking and culinary purposes?" In case of abnormal nutrition hard water may form an insoluble compound. Hard water unites with the protein, forming an insoluble protein so that part escapes the digestion. This may be avoided by adding soda. It is not advisable to use hard water, if rheumatic.

"What is the process of sending water to be analyzed?" A liberal sample, about two gallons, should be sent in a sealed jar or jug to the chemist selected.

"How can we present the subject of attractive dress in words of one syllable?" First, simplicity; good materials; the appropriateness of a textile to the use of the dress; avoid extremes. It is desirable to have for exhibition one or two dresses simple in design and suitable for their purpose.

"Which shall we advise — ready-made or home-made clothes?" This will depend somewhat on the cost and durability of the ready-made clothes in comparison with the homemade, and the time and ability of the homemaker to make the clothing for her family.

"What is the proper use of large figured wall paper?" For kindling fires.

"What shall be the final teaching in the use of a septic tank?" First, that every home should have a water supply and a sewage system. Second, at present the septic tank is the best system for the disposal of sewage. Third, use the present chart of the State Department of Agriculture, study the soils, and refer your conditions to the experts there.

"What are the rules for hanging pictures on the wall?" First, they should be hung with two cords, on a level with the eye. Group the small pictures and give a feeling of order by having

the top or bottom of the pictures on a level. Pictures are not necessary to the decoration of the room. Poor pictures are decidedly not desirable.

"Where do family portraits belong?" The family portraits, through sentiment, belong in the bedrooms if not dispensed with altogether. Use questions to make the women think whether or not they are decorative.

"What will take ink spots from linen?" Rust soap or rust eradicator. Cost 10 cents.

"How can biting of the finger nails be cured?" Usually this is due to a nervous condition which should be remedied. The habit may be broken by covering the ends of the fingers with some bitter harmless substance.

"What are the causes of sour stomachs?" Hyper-acidity or hypo-acidity of the stomach, improper feeding and an unclean mouth.

"What progress has the textile law made?" Very little.

"Describe a suitable style for a house dress or work apron." Simple straight lines. A style which can be easily laundered.

Miss Van Rensselaer, after the question box, took up the relation of the college to the institute worker, stating that bulletins of the college would be sent to the workers. She asked that the workers donate items of interest to the bulletins and expressed her desire that the institute force of women take a more vital part in Farmers' Week at the college. She asked that specific questions be referred to the department, saying that their editor would answer requests and keep the answers for printed material.

Mrs. Phelps gave a talk on reading. She suggested that the deterioration in the country was due to the lack of good reading and thinking. Rural people are losing their power to digest what they read. Books should be chosen more wisely, especially for children. She advised that the books given to children be as written and not revised to words of one syllable. Two types of novels were discussed, those that make us think and those that stop thinking.

Mrs. Morgan's talk, "Glorifying Our Work," was as usual an inspiration and was thoroughly enjoyed by all present.

This completed the women's work of the Normal Institute.

REGULAR INSTITUTE WORK

The following tables give a detailed account of those who were engaged in the work, and of places where institutes were held, with the attendance. This is important from the standpoint of permanent record and also for comparison.

Thirty-eight meetings were held in new places.

It will be noted that nearly all the meetings were for one day, consisting of three sessions. In most counties the demand for meetings is so much greater than is the number of days that can be given to the work that most places prefer to accept the institute for a single day rather than to wait for a year or two with the prospect of having a two-day meeting. Unquestionably, more people are reached and more good is accomplished than though there were a less number of meetings of longer duration with more subjects thoroughly discussed. A one-day meeting requires a smaller force than one for two days. This about balances the extra cost of more travel incident to a greater number of meetings. One-day meetings are very much more trying to the worker, necessitating an evening session six nights in the week, and allowing time for travel only between 10 P. M. and 10 A. M.

Two men and one woman constitute the regular force. Only in a few instances was there added a fourth worker, although many times this would have been desirable, either from the standpoint of the special expert advice from our experiment station workers or for the purpose of relieving an overburdened corps of workers. Lack of funds made it necessary to reduce the force to the smallest possible number. Another fact in this connection is worthy of careful consideration — particularly on the part of those who have to do with making appropriations — namely, the training of new workers. There is no place except the platform where workers can acquire their final training for the work. To compel a new worker to carry one-third of the burden is unfair to him, to the other members of the force, and to the audience. If, therefore, satisfactory recruits are to be trained for this work without detri-

ment to it at the outset, there should be sufficient funds to admit of employing inexperienced workers in addition to the regular force.

WOMEN'S WORK

In every institute a woman made one of the corps. A separate women's session was held during a portion of the afternoon, the woman worker also making an address at the evening session.

This year, in every place, in addition to the regular correspondent, a woman was selected especially to look after the women's work. With her, the woman worker corresponded before the meeting, ascertaining local conditions and subjects that would be most helpful. Not only did this enhance the local interest and increase the attendance of women, but it did much to make the institute as a whole more popular. The best testimony as to how the women's work is received is the fact that, despite bad weather and roads, fully 1,300 more women attended than in the previous year.

At Dansville, Livingston County, a three-day women's institute was held, which was in charge of Mrs. Ida S. Harrington, assisted by Mrs. Orra P. Phelps and Miss Sara B. Huff. The attendance is shown in the table on page 2497, and the interest was all that could be desired.

A series of ten special meetings was conducted by Mrs. Orra P. Phelps in places where institutes had been held during the winter and where a desire was expressed for an extension of the work. When it proved convenient and time permitted, visits were made in the morning at the homes. In the afternoon a meeting for women was held, which consisted of demonstration work and round-table discussion. A second session was held in the evening, where usually a lecture was given, and was often attended by both men and women.

Note.—See page 2509, "Learning to Read," by Mrs. Orra P. Phelps.

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COUNTY AND PLACE	LOCAL CORRESPONDENT	DATE	SESSIONS	ATTENDANCE	AVERAGE PER SESSION
ALBANY:		1916	18	847	47
Delmar.....	S. V. B. Haswell, R. D.....	Jan. 3-4	5	129	26
Guilderland Center..	W. B. Mynderse, Guilderland.	Mar. 13	3	150	50
Knox.....	Stanley Williams.....	1915 Dec. 27	2	134	67
Latham.....	J. G. Hills, Newtonville.....	1916 Mar. 16	2	86	43
Medusa.....	C. J. Waldron.....	1915 Dec. 3	3	204	68
Ravena.....	Andrew J. Greene.....	1916 Mar. 14	3	144	48
ALLEGANY:			24	2 021	84
Belfast.....	C. R. Seely, Box 125.....	Jan. 12	3	174	58
Black Creek.....	F. D. Stowell.....	Jan. 14	3	262	87
Bolivar.....	E. J. Phillips.....	Jan. 18	3	121	40
Friendship.....	D. P. Barnes.....	Jan. 19	3	280	93
Short Tract.....	S. B. Luckey, Fillmore.....	Jan. 13	3	304	101
Stanards.....	W. U. Rixford, R. D. 1, Wells- ville.....	Jan. 20	3	250	83
West Clarksville.....	G. A. Goss, R. D. 2, Cuba.....	Jan. 17	3	185	62
Whitesville.....	Geo. H. McKee.....	Jan. 24	3	445	148
BROOME:			13	655	50
Harpursville.....	C. D. Wasson, Nineveh.....	Mar. 15	1	30	30
Maine.....	E. F. Vincent.....	Feb. 23	3	134	45
North Colesville.....	S. A. Holcomb, R. D. Tunnel.	Mar. 14	2	145	73
West Chenango.....	H. L. Johnson, R. D. 1, John- son City.....	Feb. 24	3	159	53
Whitney Point.....	W. D. Valentine.....	Feb. 26	2	58	29
Windsor.....	A. B. Griffen, R. D. 6, Susque- hanna, Pa.....	Jan. 8	2	129	65
CATTARAUGUS:			23	2 014	88
Ashford.....	C. L. Hughey, R. D., West Valley.....	Jan. 10	2	200	100
Elkdale.....	W. E. Niles, R. D. 1, Sala- manca.....	Jan. 5	3	138	46
Ellicottville.....	A. H. Coit.....	Jan. 6	3	283	94
Farmersville Station..	M. H. Wilder.....	Jan. 11	3	356	119
Hinsdale.....	G. M. Brown.....	Jan. 15	3	281	94
Machias.....	Frank J. Hughes.....	Jan. 8	3	365	122
Napoli.....	C. E. Van Aken, Little Valley.	Jan. 4	3	268	89
Perrysburg.....	Charles Cowden.....	1915 Dec. 10	3	123	41
CAYUGA:		1916	20	1 566	78
Conquest.....	E. S. Wilcox, R. D. 39, Port Byron.....	Mar. 14	3	186	62
Dresserville.....	R. R. Lawrence, Moravia.....	Jan. 14	3	163	54
East Venice.....	Chas. E. Stanton, R. D. 18, Moravia.....	Mar. 3	2	95	48
Fair Haven.....	M. C. Turner.....	Jan. 20	3	303	101
Locke.....	Fay L. Cruthers.....	Jan. 13	3	287	96
Owasco.....	James S. Kenyon.....	Jan. 15	3	215	72
Weedsport.....	George B. Goodell.....	Mar. 4	3	317	106
CHAUTAQUA:		1915	36	2 739	76
Ashville.....	Earle W. Gage.....	Dec. 17	3	220	73
Brocton.....	I. Wilcox, Portland.....	Dec. 11	3	265	88
Busti.....	J. W. Sanbury, R. D. 79, Jamestown.....	Dec. 18	3	275	92
Cassadaga.....	Charles Bard.....	Dec. 20	3	185	62
Cherry Creek.....	A. H. Blaisdell.....	Dec. 23	3	176	59
Clymer.....	C. W. Vrooman, R. D. 61, North Clymer.....	Dec. 13	3	374	125
Findley Lake.....	Chas. H. Smith, R. D. 51, Sherman.....	Dec. 15	3	326	109
Frewsburg.....	R. F. Cass.....	Dec. 22	3	224	75
Kennedy.....	Henry P. Harris.....	1916 Jan. 3	3	106	35
Mayville.....	A. S. Harrington, R. D. 25, Mayville.....	1915 Dec. 16	3	258	86
Sherman.....	Chas. D. Vrooman.....	Dec. 14	3	125	42
Stockton.....	F. M. Hammond.....	Dec. 21	3	205	68

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COUNTY AND PLACE	LOCAL CORRESPONDENT	DATE	SESSIONS	ATTENDANCE	AVERAGE PER SESSION
CHEMUNG:		1916	15	1 074	72
Big Flats.....	F. A. Havens.....	Feb. 5	2	203	68
Erin.....	E. E. Welton.....	Feb. 16	3	323	108
Hicks.....	Allison Loomis, Lockwood.....	Feb. 17	3	166	55
Sullivanville.....	J. H. Mallory, Jr., R. D. 3, Horseheads.....	Feb. 15	3	238	79
Veteran Grange.....	Geo. E. Rundle, Horseheads.....	Feb. 14	3	144	48
CHENANGO:		1915	14	863	62
Beaver Meadow.....	W. A. Webb.....	Dec. 21	3	223	74
		1916			
New Berlin.....	Fred J. Vail.....	Mar. 14	2	205	103
Smithville Flats.....	E. H. Skillman.....	Feb. 25	3	202	67
		1915			
Smyrna.....	C. A. Tinker.....	Dec. 20	3	160	53
		1916			
South New Berlin.....	H. H. Goodenow.....	Mar. 15	2	52	26
West Bainbridge.....	H. H. Lyon, Bainbridge.....	Mar. 16	1	21	21
CLINTON:		1915	16	954	60
Altona.....	R. L. Lachapelle.....	Dec. 10	3	81	27
Churubusco.....	Thomas F. Looby.....	Dec. 11	3	125	42
Ellenburg Center.....	C. D. Watson.....	Dec. 14	2	92	46
Mooers.....	James Davidson, Mooers Forks.....	Dec. 9	3	84	28
Morrisonville.....	W. H. Banker, R. D. 4, Plattsburg.....	Dec. 8	3	216	72
Saranac.....	Mrs. J. T. Hayes, R. D. 1, Cadyville.....	Dec. 7	2	356	178
COLUMBIA:		1916	21	1 295	62
Claverack.....	H. J. Miller, R. D.....	Feb. 12	3	199	66
Copake.....	Frank Sherman.....	Jan. 31	3	242	81
East Chatham.....	R. R. Lant.....	Feb. 15	3	185	62
Germantown.....	Henry Fingar.....	Feb. 10	3	242	81
Livingston.....	R. G. Patrie.....	Feb. 11	3	202	67
New Lebanon.....	B. H. Richmond, New Lebanon Center.....	Feb. 16	3	129	43
Spencertown.....	F. C. Goodrich, East Chatham.....	Feb. 14	3	96	32
CORTLAND:			20	1 342	67
Cincinnatus.....	A. L. Cook.....	Mar. 1	3	421	140
Cortland.....	E. N. Reed, R. D. 3.....	Mar. 11	2	123	62
Cuyler.....	C. E. Midlam, R. D.....	Mar. 8	1	72	72
Freetown Corners.....	Emory Cobb, R. D. 3, Marathon.....	Mar. 2	2	93	47
Homer.....	E. L. Hull, R. D. 1.....	Mar. 10	2	121	61
Marathon.....	B. E. Botting.....	Mar. 3	3	193	64
Preble.....	W. W. Root.....	Mar. 9	2	50	25
Taylor Center.....	A. H. Loope, R. D., Cincinnatus.....	Feb. 29	2	106	53
Texas Valley.....	F. G. Carter, R. D. 1, Marathon.....	Mar. 3-4	3	163	54
DELAWARE:		1915	18	915	51
Bloomville.....	Chas. O. Coan.....	Dec. 10	3	148	49
Davenport.....	C. G. Maynard, Fergusonville.....	Dec. 11	3	159	53
Franklin.....	A. W. Rowell.....	Dec. 13	3	146	49
Halcottsville.....	A. R. Sanford.....	Dec. 7	3	142	47
Hamden.....	J. C. Trylone.....	Dec. 15	3	185	62
Hobart.....	J. A. Mihalko.....	Dec. 9	3	135	45
DUTCHESS:		1916	21	1 186	56
Beekman.....	Oscar Shaffer, Hopewell Jct.....	Jan. 26	3	187	62
Clinton Corners.....	M. E. Knapp, Millbrook.....	Feb. 1	3	199	66
Moores Mills.....	James Skidmore, Pleasant Valley.....	Feb. 4	3	164	55
Myers Corners.....	H. J. Smith, New Hackensack.....	Feb. 3	3	114	33
Pleasant Plains.....	F. M. Barker, Staatsburg.....	Feb. 5	3	280	93
Pleasant Valley.....	Chas. S. Tanner.....	Feb. 2	3	71	24
Upper Red Hook.....	Curtis Fraleigh, Red Hook.....	Feb. 9	3	171	57

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COUNTY AND PLACE	LOCAL CORRESPONDENT	DATE	SES- SIONS	AT- TEND- ANCE	AVER- AGE PER SESSION
ERIE:		1915	27	2 109	78
Akron.....	E. F. Strickland.....	Dec. 4	3	269	90
Angola.....	Chas. E. Backus, Derby.....	Dec. 8	3	207	69
Clarence.....	John Seyfang.....	Dec. 3	3	207	69
Crittenden.....	G. F. Ayers.....	Dec. 2	3	187	62
Eden Center.....	W. A. Clark, Eden.....	Dec. 9	3	200	67
Griffins Mills.....	R. C. Grover, West Falls.....	Nov. 29	3	162	54
Marilla.....	W. B. Taylor.....	Dec. 1	3	296	99
Swormville.....	Rev. A. F. Veit.....	Dec. 6	3	400	133
Williamsville.....	W. H. Beach, Forks.....	Nov. 30	3	181	60
ESSEX:			19	1 614	85
Crown Point.....	W. S. Green.....	Nov. 30	3	195	65
Jay.....	Francis D. Lennon.....	Dec. 6	3	484	161
Keeseville.....	S. H. Thompson.....	Dec. 4	3	170	57
Moriah.....	G. W. Witherbee, Moriah Ctr.....	Dec. 1	3	280	93
Olmstedville.....	F. M. LaBar, Minerva.....	Oct. 20	2	169	85
Reber.....	G. H. West.....	Dec. 3	3	213	71
Wadhams.....	Geo. K. French.....	Dec. 2	2	103	52
FRANKLIN:			16	921	58
Bangor.....	W. D. Taylor, North Bangor.....	Dec. 15	2	71	36
Bombay.....	Geo. Rockwood.....	Dec. 17	3	128	43
Brushton.....	George DeLong.....	Dec. 20	3	208	69
Dickinson Center.....	Lewis P. Peets.....	Dec. 21	2	147	74
Gabriels.....	J. J. FitzGerald, Harriestown.....	Dec. 13	3	156	52
Westville Corners.....	H. E. Hoyt, Constable.....	Dec. 16	3	211	70
GENESEE:		1916	26	2 367	91
Alexander.....	Earl Kidder.....	Feb. 7	3	119	40
Batavia.....	R. J. Shepard.....	Feb. 4-5	5	557	111
Bethany.....	Harry Woolf, Linden.....	Feb. 8	3	441	147
Byron.....	Thomas Roach.....	Feb. 15	3	316	105
Corfu.....	D. C. Higgins.....	Jan. 31	3	235	78
Elba.....	J. S. Wilford.....	Feb. 14	3	181	60
Fort Hill.....	D. J. Renegar, LeRoy.....	Feb. 1	3	303	101
Pavilion Center.....	Eben Coffey, R. D., Pavilion.....	Jan. 31	3	215	72
GREENE:		1915	12	839	70
Durham.....	W. E. Morse.....	Dec. 2	3	177	59
Freehold.....	R. T. Story.....	Dec. 4	3	208	69
Halcott Center.....	J. B. Scudder.....	Dec. 6	3	284	95
Leeds.....	D. J. Hamm.....	Jan. 5	3	170	57
HERKIMER:		1915	19	844	44
Columbia.....	Chas. Gage, R. D. 2, Ilion.....	Dec. 8	3	155	52
Fairfield.....	E. B. Hilligas, Middleville.....	Nov. 29	3	106	35
Jordanville.....	E. L. Walrath, R. D. 2, Rich- field Springs.....	Mar. 16	2	101	51
Newville.....	L. G. Smith, R. D., Mohawk.....	Dec. 6	3	210	70
Ohio.....	C. J. Morgan.....	Dec. 28	2	56	28
Russia.....	Wm. H. Hughes, Barneveld.....	Nov. 30	3	102	34
Van Hornesville.....	H. E. Mixer, R. D., Jordan- ville.....	Dec. 7	3	114	38
JEFFERSON:		1916	34	2,030	60
Adams.....	C. P. Murray, Rodman.....	Jan. 14-15	5	299	60
Carthage.....	I. S. Chaffee.....	Dec. 11	3	233	78
Chaumont.....	W. D. Valley.....	Dec. 21	3	122	41
Clayton.....	O. O. Sheley.....	Dec. 15	3	122	41
Depauville.....	Adam Dorr.....	Dec. 20	3	214	71
Great Bend.....	George R. Ware.....	Dec. 14	3	66	22
Natural Bridge.....	Earl H. Allen.....	Dec. 13	3	179	60
Pamelia Four Corners.....	E. H. Miller, Evans Mills.....	Jan. 11	3	318	106
Plessis.....	A. H. Rowell, R. D., LaFarge- ville.....	Dec. 17-18	5	270	54
Smithville.....	O. U. Ivory.....	Dec. 22	3	207	69

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COUNTY AND PLACE	LOCAL CORRESPONDENT	DATE	SESSIONS	ATTENDANCE	AVERAGE PER SESSION
LEWIS:			17	1,491	88
Barnes Corners.....	C. E. Greenley.....	Dec. 8	3	184	61
Copenhagen.....	A. M. Seymour.....	Dec. 9	3	200	67
Croghan.....	P. J. Ulrich, R. D. 2.....	Dec. 3-4	5	819	164
Glenfield.....	A. H. Stiles.....	Dec. 6	3	113	38
Harrisburg.....	F. J. Grupe, R. D. 2, Lowville.....	Dec. 7	3	175	58
LIVINGSTON:		1916	20	1,427	71
Caledonia.....	Merton Phelps.....	Feb. 9	3	226	75
Conesus.....	Charles McGinty.....	Feb. 8	3	270	90
Greigsville.....	K. H. Johnson.....	Feb. 10	3	167	56
Groveland.....	E. W. Kinney, Groveland Sta.....	Feb. 11	3	206	69
Nunda.....	H. F. Collister, Mt. Morris.....	Jan. 26	3	241	80
Sparta Center.....	Rev. W. A. Brown, Dansville.....	Feb. 12	2	105	53
Springwater.....	Scott Swarts.....	Feb. 7	3	212	71
MADISON:			34	1,893	56
Brookfield.....	C. W. Caminga, R. D., West Edmeston.....	Mar. 13-14 1915	5	342	68
Cazenovia.....	C. C. Kent.....	Dec. 14 1916	3	121	40
De Ruyter.....	Rev. A. L. Briddon.....	Mar. 7-8 1915	4	400	100
Erieville.....	F. A. Wagner.....	Dec. 16	3	135	45
Fenner.....	C. A. Coleman, R. D. 1, Chittenango.....	Dec. 13 Dec.	3 2	243 72	81 36
Hamilton.....	W. F. Ingalls.....	1916			
Hubbardsville.....	Fay I. Rhoades, R. D., Hubbardsville.....	Mar. 10 1915	2	78	39
Lebanon.....	A. H. Cole.....	Dec. 17	3	121	40
Madison.....	W. T. Taylor, Solsville.....	Dec. 23	3	108	36
New Woodstock.....	A. L. LaMunion, R. D., New Woodstock.....	1916 Mar. 6	3	140	47
Stockbridge.....	C. E. Love, Munnsville.....	1915 Dec. 22	3	133	44
MONROE:		1916	31	2,660	86
Churchville.....	A. S. Hill.....	Feb. 3	3	178	59
Gates.....	J. C. Curry, Jr., Lincoln Park.....	Feb. 2	3	179	60
Greece.....	J. S. Kenyon, Barnard.....	Feb. 18	3	199	66
Hamlin.....	C. H. Kenyon, Morton.....	Feb. 16	3	184	61
Hilton.....	E. B. Holden.....	Feb. 17	3	313	104
Mendon.....	A. J. Hill, Victor.....	Feb. 28	2	93	47
Penfield.....	J. H. Ammon.....	Feb. 12	3	202	67
Pittsford.....	J. M. Todd.....	Jan. 24	3	297	99
Webster.....	Geo. W. Dunn.....	Feb. 25-26	5	756	151
West Henrietta.....	H. U. Martin.....	Jan. 25	3	259	86
MONTGOMERY:		1915	15	765	51
Canajoharie (Seeber's Lane Grange).....	C. L. St. John, Canajoharie.....	Dec. 3	3	186	62
Charleston-Four-Corners.....	O. A. Tillapaugh, R. D. 1, Sloansville.....	Dec. 1	3	136	45
Hallsville.....	Grant Moyer, R. D. 2, Fort Plain.....	Dec. 4	3	204	68
Minaville.....	H. A. Hewitt.....	Nov. 29	3	119	40
Rural Grove.....	A. H. Diefendorf, Sprakers.....	Dec. 2	3	120	40
NASSAU:		1916	4	192	48
Mineola.....	L. R. Simons.....	Jan. 25-26	4	192	48
NIAGARA:			26	2,440	94
Gasport.....	E. S. Gifford, R. D. 8, Lockport.....	Feb. 5	3	298	99
Johnson's Creek.....	W. W. Prudom, Middleport.....	Feb. 7	3	290	97
Newfane.....	E. J. Lapham, Burt.....	Feb. 4	3	207	69
Pekin.....	A. J. Bridgeman, R. D. 17, Sanborn.....	Feb. 1	3	452	151

INSTITUTE WORK, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE — (Continued)

REGULAR INSTITUTES

COUNTY AND PLACE	LOCAL CORRESPONDENT	DATE	SESSIONS	ATTENDANCE	AVERAGE PER SESSION
NIAGARA — Continued					
Pendleton Center...	L. J. P. Richards, R. D. 4, Lockport.	1916 Feb. 12	3	268	89
Ransomville.....	W. D. Wisner.....	Feb. 2	3	242	81
Rapids.....	C. H. Burdick, R. D. 6, Lockport.	1915 Dec. 7	3	364	121
Tuscarora Reservation	S. H. Cain, R. D. 18, Lewiston	Nov. 19	2	117	59
Wilson.....	R. M. Farley, Burt.....	1916 Feb. 3	3	202	67
ONEIDA:					
Boonville.....	D. M. Blue.....	1915 Dec. 2	17 3	1,070 114	63 38
Bridgewater.....	H. H. Fitch, West Winfield...	1916 Mar. 11	2	97	49
Floyd.....	Wm. G. Smith, Stittville.....	1915 Dec. 1	3	154	51
Lee.....	B. F. Ranney, Taberg.....	Dec. 10	3	155	52
Vernon Center.....	Richard Peenstra.....	Dec. 11	3	285	95
Verona.....	Judson Davis, Verona Station.	1916 Jan. 27	3	265	88
ONONDAGA:					
Baldwinsville.....	O. J. Brown.....	Jan. 17	27 3	1,601 276	59 92
Camillus.....	T. H. Munro.....	Jan. 28	3	96	32
Cicero.....	E. C. Hazard, Clay.....	Jan. 24	3	291	97
Jamesville.....	F. J. Gates.....	Mar. 6	2	92	46
Jordan.....	J. P. Watts.....	Jan. 29	3	193	64
LaFayette.....	W. C. Newell.....	Mar. 8	2	62	31
Manlius.....	Frank Broadfield.....	Mar. 15	3	168	56
Marcellus.....	Elmer Clark.....	Mar. 9	2	79	40
Skaneateles.....	John Tucker.....	Mar. 13	3	129	43
Tully.....	A. E. Ellis, R. D. 3, Tully....	Mar. 7	3	215	72
ONTARIO:					
Bristol Center.....	W. R. Allen.....	Mar. 1	24 3	1,997 206	83 69
Canandaigua.....	H. R. Day, R. D. 7, Canandaigua.	Feb. 29	3	189	63
Naples.....	M. M. Wheeler.....	Mar. 8	3	252	84
Phelps.....	M. E. Warner.....	Feb. 17	3	202	67
Reeds Corners.....	James Roat, R. D., Canandaigua.	Mar. 2	3	287	96
Seneca Castle.....	Levi Page.....	Mar. 9	3	275	92
Victor.....	A. G. Aldridge.....	Feb. 16	3	392	131
West Bloomfield.....	Chas. M. Duffy, Bloomfield....	Feb. 21	3	194	65
ORANGE:					
Amity.....	R. J. Doty.....	Jan. 14	23 3	1,010 71	44 24
Balmville.....	Gurnsey Sheeley, R. D., Newburg.	Jan. 20	3	159	53
Brookside.....	E. Titus, R. D. 4, Newburg....	Jan. 19	3	160	53
Bullyville.....	I. V. Ellis, Circleville.....	Jan. 12	3	125	42
Florida.....	C. S. Durland.....	Jan. 15	3	58	19
Port Jervis.....	L. A. Johnson, Sparrow Bush.	Jan. 11	2	71	36
Unionville.....	John E. Farley, Box 7, Unionville.	Jan. 13	3	232	77
Walden.....	J. A. Kelso.....	Jan. 22	3	134	45
ORLEANS:					
Clarendon.....	A. C. Bowen.....	Feb. 11	17 3	1,595 101	94 34
Fast Shelby.....	B. C. Roberts, Medina.....	Feb. 9	3	298	99
Kendall.....	L. M. Wellman.....	Feb. 15	3	352	117
Knowlesville.....	Wm. J. Howlett.....	Feb. 10	3	335	112
Lyndonville.....	C. H. I. Potter.....	Feb. 14	3	265	88
Medina.....	Jay E. Ellis.....	Feb. 8	2	244	122
OSWEGO:					
Altmar.....	J. H. Campbell, R. D., Altmar.	Jan. 12	36 3	3,201 170	89 57
Bernhards Bay.....	H. E. Myers.....	Jan. 26	3	272	91
Central Square.....	Chas. B. Allen.....	Jan. 25	3	470	157
Fulton.....	W. H. Pollard.....	Jan. 21-22	5	501	100
Hannibal.....	P. A. Welling.....	Jan. 21-22	5	828	166

INSTITUTE WORK, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE — (Continued)

REGULAR INSTITUTES

COUNTY AND PLACE	LOCAL CORRESPONDENT	DATE	SESSIONS	ATTENDANCE	AVERAGE PER SESSION
OSWEGO — Continued					
Lacona.....	A. R. Stevens.....	1915 Dec. 23	3	114	38
Mt. Pleasant.....	Chas. N. Potter, R. D. 2, Fulton.....	1916 Jan. 19	2	152	76
North Scriba.....	O. H. Cornwell, R. D. 1, Oswego.....	Jan. 18	3	133	44
Orwell.....	C. J. Potter.....	Jan. 13	3	202	67
Palermo.....	M. E. Dolbear, R. D. 4, Fulton.....	Jan. 20	3	213	71
Williamstown.....	E. N. Harris.....	1915 Dec. 9	3	146	49
OTSEGO:					
Burlington.....	D. S. Ritter.....	Dec. 21	23 3	1,505 216	65 72
East Springfield.....	J. J. Walrath.....	Dec. 23	3	138	46
Elk Creek.....	Theodore Knapp.....	1916 Mar. 16	1	58	58
Milford.....	R. R. Bennett.....	1915 Dec. 17	2	151	76
New Lisbon.....	Andrew Carleton.....	Dec. 20	3	238	79
Otego.....	W. J. Birdsall.....	Dec. 16	3	138	46
Pierstown.....	G. T. Burnell, R. D. 1, Cooperstown.....	Dec. 18	2	108	54
West Exeter.....	W. Wright.....	Dec. 22	3	143	48
Worcester.....	N. E. Vredenburg, R. D. 3, Worcester.....	Dec. 28	3	315	105
PUTNAM:					
Adams Corners.....	Leander Curry, Tompkins Corners.....	1916 Jan. 25	9 3	579 228	64 76
Mahopac.....	F. J. Ganong.....	Jan. 28	3	84	28
Patterson.....	E. F. Hayt, Brewster.....	Jan. 27	3	267	89
RENSSELAER:					
Eagle Mills.....	J. H. Potter.....	Mar. 4	18 3	1,119 148	62 49
Johnsonville.....	C. M. Harrington.....	Feb. 18	3	245	82
Melrose.....	Chas. B. Hanaman.....	Feb. 19	3	157	52
Raymertown.....	E. L. Button, Melrose.....	Mar. 2	3	277	92
Stephentown.....	W. L. Cranston.....	Feb. 17	3	130	43
Wynantskill.....	Chas. B. Hidley.....	Mar. 3	3	162	54
ROCKLAND:					
Tallmans.....	T. T. Husson, Pomona.....	Jan. 17-18	5 5	204 204	41 41
ST. LAWRENCE:					
Brier Hill.....	Clark Rogers.....	1915 Dec. 16	35 3	2,611 298	75 99
Crary Mills.....	Frank Crary, R. D. 5, Canton.....	1916 Jan. 10	3	211	70
DeKalb Jct.....	R. E. Piercy.....	Jan. 7	3	206	69
DePeyster.....	Roy Badger.....	Jan. 8	2	183	92
Fine.....	L. J. Harris.....	1915 Dec. 10	3	264	88
Lawrenceville.....	J. P. Hourihan, R. D., North Lawrence.....	1916 Jan. 3	3	161	54
Madrid.....	A. J. Rutherford, R. D. 3, Madrid.....	Jan. 6	3	226	75
Massena.....	B. E. Hackett, R. D. 1, Massena.....	1915 Dec. 18	3	181	60
Nicholville.....	J. H. Smith.....	Dec. 22	3	183	61
Norfolk.....	C. A. Whittaker, Raymondville.....	1916 Jan. 5	3	87	29
Parishville.....	E. J. Courser.....	1915 Dec. 23	3	196	65
Winthrop.....	H. L. Davis.....	1916 Jan. 4	3	415	138
SARATOGA:					
Charlton.....	Rev. R. C. Hoag, Ballston Lake.....	Mar. 8	17 2	990 81	58 41
Clifton Park Center.....	J. F. Peck, R. D. 1, Rexford.....	Mar. 6	3	175	58
Edinburg.....	L. L. Frazier.....	1915 Oct. 22	3	132	44

INSTITUTE WORK, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE — (Continued)

REGULAR INSTITUTES

COUNTY AND PLACE	LOCAL CORRESPONDENT	DATE	SESSIONS	ATTENDANCE	AVERAGE PER SESSION
SARATOGA — Continued					
Galway.....	F. L. Smith, R. D. 1, Ballston.	Mar. 7	3	292	97
Gurn Spring.....	A. H. Cary, R. D. 1, Gansevoort.....	Feb. 28	3	143	48
Malta.....	Elmer Mealio, R. D. 3, Mechanicville.....	Feb. 29	3	167	56
SCHENECTADY:					
Braman Corners.....	Clarence Foote, R. D. 1, Delanson.....	Nov. 30	3	223	74
Glenville.....	Mina Van Epps, Hoffmans...	June 9	3	152	51
SCHOHARIE:					
Broome Center.....	E. P. Cook, Gilboa.....	Dec. 1	3	150	50
Fultonham.....	J. C. Bouck, Middleburg.....	Nov. 30	3	61	20
Gallupville.....	G. E. Becker.....	Nov. 29	3	114	38
Hyndsville.....	B. C. Holmes.....	Dec. 29	3	61	20
Jefferson.....	F. H. Foote.....	Dec. 8	3	214	71
Sharon Springs.....	Wm. M. Kling.....	Dec. 30	3	136	45
SCHUYLER:					
Beaver Dams.....	Mrs. J. B. Moore.....	Feb. 23	3	216	72
Burdett.....	W. K. Mulligan.....	Feb. 25	3	281	94
Catherine.....	Mrs. M. H. Hewitt, R. D. 3, Alpine.....	Feb. 24	3	178	59
Moreland.....	A. H. Russell, R. D. 2, Beaver Dams.....	Feb. 22	3	198	66
Townsend.....	Geo. Raplee, R. D. 3, Watkins	Feb. 19	3	166	55
Tyrone.....	Edward Green, R. D. 18, Dundee.....	Feb. 21	3	255	85
SENECA:					
Covert.....	E. A. Hawkes, R. D., Trumansburg.....	Feb. 26	2	146	73
Seneca Falls.....	Wm. T. Beach, R. D. 3, Seneca Falls.....	Mar. 10-11	5	284	57
STEUBEN:					
Atlanta.....	C. G. Gray, North Cohocton..	Feb. 3	3	248	83
Bath.....	Ed. Heinaman.....	Jan. 29	3	271	90
Big Creek.....	C. M. Burdett, R. D. 3, Hornell.....	Jan. 27	3	229	76
Canistero.....	J. A. Allen.....	Jan. 21-22	5	248	50
Cohocton.....	C. J. Flint.....	Feb. 4	3	459	153
Ingleside.....	C. E. Noble, Prattsburg.....	Feb. 2	3	347	116
North Urbana.....	E. F. Gleason.....	Jan. 31	3	306	102
Prattsburg.....	W. H. Babcock.....	Feb. 1	3	426	142
Savona.....	Fred D. Ward.....	Jan. 28	3	112	37
Stephens Mills.....	S. E. Harding, R. D. 2, Hornell	Jan. 26	3	257	86
Troupsburg.....	A. M. Potter.....	Jan. 25	3	531	177
SUFFOLK:					
Bridgehampton.....	H. T. Haney.....	Jan. 18-19	5	599	120
Port Jefferson Sta.....	H. L. Terry, Terryville.....	Jan. 24	3	197	66
Sound Avenue.....	H. J. Wells, Sound Ave., Riverhead.....	Jan. 21-22	5	351	70
Southold.....	G. H. Smith, Peconic.....	Jan. 20	3	203	68
Yaphank.....	C. H. Hand.....	Jan. 17	3	110	37
SULLIVAN:					
Bloomington.....	H. S. Riede, Box 114, Bloomington.....	Jan. 10	3	157	52
Hurleyville.....	F. A. Durland.....	Jan. 4	3	135	45
Jeffersonville.....	Edwin Weber.....	Jan. 6	3	221	74
Lake Huntington.....	H. J. Tyler, Cohocton Center.	Jan. 7	3	201	67
Rock Hill.....	Sanford D. Case.....	Jan. 3	2	115	58
Shandeele.....	Louis Black, R. D., Livingston Manor.....	Jan. 5	3	198	66
TIOGA:					
Apalachin.....	C. F. Giles.....	Feb. 22	3	494	165
Newark Valley.....	Paul Smith.....	Jan. 10	3	346	115
Nichols.....	J. E. Wright.....	Mar. 13	3	355	118

INSTITUTE WORK, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE — (Concluded)

REGULAR INSTITUTES

COUNTY AND PLACE	LOCAL CORRESPONDENT	DATE	SESSIONS	ATTENDANCE	AVERAGE PER SESSION
TIOGA—Continued					
North Barton.....	P. H. Wheeler, R. D. 2, Waverly.....	1916 Feb. 18	3	224	75
Spencer.....	Geo. S. Robinson.....	Feb. 21	3	313	104
Waverly.....	Wm. H. Swain.....	Feb. 19	3	142	47
TOMPKINS:			10	595	60
East Lansing.....	D. C. DeCamp, R. D. 12, Groton.....	Mar. 1	3	153	51
Groton.....	R. C. Smith, R. D. 14, Groton.....	Jan. 12	3	240	80
Speedsville.....	Dr. W. C. Gallagher, Slaterville Springs.....	Jan. 11	3	145	48
West Groton.....	Garfield Holden, R. D. 11, Groton.....	Mar. 2	1	57	57
ULSTER:			18	987	55
Gardiner.....	Joseph Deyo.....	Jan. 21	3	112	37
Mt. Marion.....	H. C. Fingar.....	Jan. 7	3	174	58
Napanoch.....	Chester Young.....	Jan. 8	3	106	35
New Paltz.....	I. C. Barnes.....	Feb. 7	3	167	56
Ulster Park.....	Geo. E. House.....	Feb. 8	3	196	65
Woodstock.....	C. N. Riseley.....	Jan. 6	3	232	77
WARREN:					
Chestertown.....	J. B. Brown.....	1915 Oct. 19	7 2	538 77	77 39
Queensbury.....	G. A. Hubbell, R. D. 1, Glens Falls.....	Oct. 18	2	233	117
Wevertown.....	F. C. Hooper, No. River.....	Oct. 21	3	228	76
WASHINGTON:			24	1,716	72
Argyle.....	R. H. Stewart, Ft. Edward.....	Feb. 24	3	417	139
Cambridge.....	J. C. Cottrell, Eagle Bridge.....	Feb. 21	3	190	63
Easton.....	J. F. Pratt, Greenwich.....	Mar. 1	3	246	82
Hartford.....	J. H. Beadle.....	Feb. 25	3	224	75
North Granville.....	Geo. Chapin, R. D. 2, Smith's Basin.....	Feb. 26	3	91	30
Putnam.....	H. L. Roberts, Putnam Station.....	1915 Nov. 29	3	86	29
Salem.....	W. S. Barker.....	1916 Feb. 22	3	193	64
West Hebron.....	Wm. E. Getty, R. D., Granville.....	Feb. 23	3	269	90
WAYNE:			23	1,945	85
Alton.....	J. M. Buerman.....	Jan. 18	3	357	119
Macedon Center.....	Philander Packard, Macedon.....	Feb. 22	3	255	85
Ontario.....	C. C. Norton.....	Feb. 19	3	222	74
Sodus.....	Peter De Mey.....	Feb. 24-25	5	345	69
South Butler.....	W. E. Hall.....	Jan. 17	3	185	62
Williamson.....	J. D. Ameele.....	Feb. 23	3	421	140
Wolcott.....	Mrs. Judd Clark.....	Jan. 19	3	160	53
WESTCHESTER:			5	742	148
Cortlandt Grange.....	Miss Emma Tice, Peekskill.....	Jan. 24	3	128	43
Lincolndale.....	Rev. Brother Henry.....	Jan. 29	2	614	307
WYOMING:			21	1,956	93
Arcade.....	Geo. E. Hogue.....	Jan. 7	3	194	65
Castile.....	E. V. Kingsley, R. D. 1, Castile.....	Jan. 27	3	250	83
Cowlesville.....	R. J. Patch.....	Feb. 11	3	335	112
Hermitage.....	Wm. Wright, R. D. 2, Gainesville.....	Jan. 28	3	279	93
North Java.....	C. E. McNulty, Java Center.....	Feb. 10	3	156	52
Strykersville.....	Ernest Holmes.....	Feb. 9	3	414	138
Wyoming.....	William E. Hurst.....	Jan. 29	3	328	109
YATES:			14	920	66
Bellona.....	Rev. T. M. Morrison.....	Mar. 3-4	5	296	59
Lakemont.....	Harry J. Roof, Dundee.....	Feb. 18	3	125	42
Middlesex.....	Frank Denton.....	Mar. 7	3	370	123
Rushville.....	C. E. James, Stanley.....	Mar. 6	3	129	43
Total.....			1,070	76,571	72

STATE-WIDE COOPERATIVE MEETINGS

New York State Agricultural Society
New York State Breeders' Association
New York State Dairymen's Association
New York State Fruit Growers' Association, Rochester and Poughkeepsie
New York State Association of County and Town Fairs
State College of Agriculture, Ithaca, Farmers' Week
State School of Agriculture, Alfred, Farmers' Week
State School of Agriculture, Delhi, Farmers' Week
State School of Agriculture, Morrisville, Farmers' Week

NUMBER OF DAYS' INSTITUTE WORK IN EACH COUNTY

COUNTY	DAYS	COUNTY	DAYS
<i>Regular Institutes</i>		<i>Regular Institutes</i>	
Albany	6	Oswego	12
Allegany	8	Otsego	8
Broome	5	Putnam	3
Cattaraugus	8		
Cayuga	7	Rensselaer	6
		Rockland	2
Chautauqua	12	St. Lawrence	12
Chemung	5	Saratoga	6
Chenango	5	Schenectady	1
Clinton	6		
Columbia	7	Schoharie	6
		Schuyler	6
Cortland	7	Seneca	3
Delaware	6	Steuben	12
Dutchess	7	Suffolk	7
Erie	9		
Essex	7	Sullivan	6
		Tioga	6
Franklin	6	Tompkins	4
Genesee	9	Ulster	6
Greene	4	Warren	3
Herkimer	7		
Jefferson	12	Washington	8
		Wayne	8
Lewis	6	Westchester	2
Livingston	7	Wyoming	7
Madison	12	Yates	5
Monroe	11		
Montgomery	5	Total	371
Nassau	2	<i>Farmers' Days</i>	
Niagara	9	Orleans	3
Oneida	6	Washington	3
Onondaga	9		
Ontario	8	Total	6
Orange	8		
Orleans	6		

RECAPITULATION FOR REGULAR INSTITUTES, FARMERS' DAYS, AND MISCELLANEOUS
MEETINGS, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE

	NO. OF MEET- INGS	SES- SIONS	TOTAL ATTEND- ANCE	AVER- AGE PER SESSION
Regular institutes.....	363	1,070	76,571	72
Farmers' days	2	16	1,902	119
Miscellaneous meetings.....	117	158	14,067	89
TOTAL.....	482	1,244	92,540	74

TABLE SHOWING RECORD OF SPECIAL WOMEN'S SESSIONS, AND REGULAR INSTITUTE SESSIONS AND SPECIAL MEETINGS ADDRESSED BY WOMEN INSTITUTE WORKERS, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE

COUNTY AND PLACE	LADY CORRESPONDENT	DATE	SPECIAL WOMEN'S SESSIONS		REGULAR INSTITUTE SESSIONS, MIXED AUDIENCES		SPECIAL MEETINGS	
			No. of sessions	Total attendance	No. of sessions	Total attendance	No. of sessions	Total attendance
ALBANY:			5	114	8	491	.....	.....
Delmar.....	Mrs. I. L. Kinney.....	Jan. 3-4, 1916	1	14	2	58	.....	.....
Guilford Center.....	Mrs. E. O. Moffet.....	Mar. 13, 1916	1	30	1	70	.....	.....
Knox.....	Mrs. Amaziah Saddlemire.....	Dec. 27, 1915	1	15	1	91	.....	.....
Latham.....	Mrs. J. P. McNab.....	Mar. 16, 1916	1	23	1	41	.....	.....
Medusa.....	Mrs. Minnie Frost.....	Dec. 3, 1915	.....	.....	2	179	.....	.....
Ravena.....	.....	Mar. 14, 1916	1	32	1	52	.....	.....
ALLEGANY:			8	331	8	704	.....	.....
Belfast.....	Mrs. Frank Weaver.....	Jan. 12, 1916	1	23	1	40	.....	.....
Black Creek.....	Mrs. J. B. Herbeck.....	Jan. 14, 1916	1	47	1	107	.....	.....
Bolivar.....	Miss Ella Crandall.....	Jan. 18, 1916	1	19	1	35	.....	.....
Friendship.....	Mrs. Frank Rogers.....	Jan. 19, 1916	1	42	1	90	.....	.....
Short Tract.....	Mrs. Ella Lilly, R. D., Fillmore.....	Jan. 13, 1916	1	51	1	95	.....	.....
Stanards.....	Mrs. Milton Wright, R. D. 2, Wellsville.....	Jan. 20, 1916	1	40	1	80	.....	.....
West Clarksville.....	Mrs. Cassius Congdon.....	Jan. 17, 1916	1	37	1	55	.....	.....
Whitesville.....	Mrs. Wm. Ladd.....	Jan. 24, 1916	1	72	1	202	.....	.....

TABLE SHOWING RECORD OF SPECIAL WOMEN'S SESSIONS, AND REGULAR INSTITUTE SESSIONS AND SPECIAL MEETINGS ADDRESSED BY WOMEN INSTITUTE WORKERS, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE — *Continued*

COUNTY AND PLACE	LADY CORRESPONDENT	DATE	SPECIAL WOMEN'S SESSIONS		REGULAR INSTITUTE SESSIONS, MIXED AUDIENCES		SPECIAL MEETINGS	
			No. of sessions	Total attendance	No. of sessions	Total attendance	No. of sessions	Total attendance
CHAUTAUQUA — <i>Continued</i>	Findley Lake	Dec.	1	47	1	150	...	...
	Frewsburg	Dec.	1	26	1	91	...	...
	Kennedy	Jan.	1	20	1	70	...	...
	Mayville	Dec.	1	33	1	20	...	...
	Sherman	Dec.	1	12	1	26	...	...
	Stockton	Dec.	1	28	1	93	...	...
	Mrs. Lena Nelson	Dec.	5	194	5	394	...	...
CHEMUNG:	Miss Harriett Carpenter	Feb.	1	31	1	87	...	...
	Mrs. Marcia Hallenbeck	Feb.	1	56	1	110	...	...
	Miss Bernice Groves, Lockwood	Feb.	1	42	1	57	...	...
	Mrs. Edith Bush	Feb.	1	40	1	86	...	...
	Mrs. Anna Van Dusen, R. D. 2, Horseheads	Feb.	1	25	1	54	...	...
	Mrs. E. D. Darling	Dec.	6	166	5	346	...	...
	Mrs. Grant B. Low	Mar.	1	31	1	95	...	...
CHENANGO:	Beaver Meadow	Mar.	1	74	1	99	...	...
	New Berlin	Mar.	1	74	1	99	...	...

Smithville Flats.....	Mrs. George McComes.....	Feb.	25, 1916	1	34	1	60	.....	.....
Smyrna.....	Mrs. C. A. Tinker.....	Dec.	20, 1915	1	18	1	66	.....	.....
South New Berlin.....	Miss Ethel Gage.....	Mar.	15, 1916	1	4	1	26	.....	.....
West Bainbridge.....	Mrs. H. H. Lyon, Bainbridge.....	Mar.	16, 1916	1	5	.....	.....	.....	.....
CLINTON:									
Altona.....	Mrs. J. J. Hornett.....	Dec.	10, 1915	6	174	5	444	.....	.....
Churubusco.....	Mrs. Thomas Dwyer.....	Dec.	11, 1915	1	12	1	29	.....	.....
Ellenbusco Center.....	Mrs. E. I. Dominy.....	Dec.	14, 1915	1	19	.....	52	.....	.....
Moore's.....	Mrs. W. K. Woodley, Moores Jct.....	Dec.	9, 1915	1	11	1	18	.....	.....
Morrisonville.....	Mrs. W. H. Banker, R. D. 4, Plattsburg.....	Dec.	8, 1915	1	28	1	107	.....	.....
Saranac.....	Mrs. J. T. Hayes, R. D. 1, Cadyville.....	Dec.	7, 1915	1	90	1	238	.....	.....
COLUMBIA:									
Claverack.....	Mrs. Charles E. Barnard.....	Feb.	12, 1916	7	242	7	471	8	395
Claverack.....	Mrs. Charles E. Barnard.....	June	6, 1916	1	40	1	57	.....	51
Copake.....	Mrs. J. W. Scott.....	Jan.	31, 1916	1	36	1	72	.....	.....
Copake.....	Mrs. J. W. Scott.....	June	5, 1916	.....	.....	.....	.....	1	32
East Chatham.....	Mrs. Charles G. Brown.....	Feb.	15, 1916	1	48	1	60	.....	.....
German town.....	Mrs. Alex. Salpaugh.....	Feb.	10, 1916	1	42	1	109	.....	.....
Hudson.....	Mrs. H. B. Wood.....	Nov.	8-9-10, 1915	.....	.....	.....	.....	4	295
Livingston.....	Miss Margaret S. Weeks.....	Feb.	11, 1916	1	38	1	86	.....	.....
New Lebanon.....	Miss Fannie Sackett.....	Feb.	16, 1916	1	20	1	58	.....	.....
New Lebanon.....	Miss Fannie Sackett.....	June	3, 1916	.....	.....	.....	.....	1	17
Spencertown.....	Mrs. Chas. E. Streever, R. D. 1, Chatham.....	Feb.	14, 1916	1	18	1	29	.....	.....
CORTLAND:									
Cincinnati.....	Mrs. K. D. Bolser.....	Mar.	1, 1916	8	349	3	196	.....	.....
Cortland.....	Mrs. I. F. Rice.....	Mar.	11, 1916	1	135	1	126	.....	.....
Cuyler.....	Mrs. L. R. Cossett, R. D.....	Mar.	8, 1916	1	35	.....	.....	.....	.....
Freetown Corners.....	Mrs. Rachel Coolbaugh, McGraw.....	Mar.	2, 1916	1	17	.....	.....	.....	.....
Homer.....	Mrs. Esther Hull, R. D. 1.....	Mar.	10, 1916	1	36	.....	.....	.....	.....
Marathon.....	Mrs. Charles Youngs, R. D. 1.....	Mar.	3, 1916	1	36	1	26	.....	.....
* Preble.....	Mrs. J. K. Henderson.....	Mar.	9, 1916	.....	.....	.....	.....	.....	.....
Taylor Center.....	Mrs. Frank S. Wood, R. D., Cincinnati.....	Feb.	29, 1916	1	24	.....	.....	.....	.....
Texas Valley.....	Mrs. L. J. Lull, R. D. 1, Marathon.....	Mar.	3-4, 1916	1	28	1	44	.....	.....

* Meeting arranged for, but, on account of storm, speakers unable to be present.

TABLE SHOWING RECORD OF SPECIAL WOMEN'S SESSIONS, AND REGULAR INSTITUTE SESSIONS AND SPECIAL MEETINGS ADDRESSED BY WOMEN INSTITUTE WORKERS, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE — *Continued*

COUNTY AND PLACE	LADY CORRESPONDENT	DATE	SPECIAL WOMEN'S SESSIONS		REGULAR INSTITUTE SESSIONS, MIXED AUDIENCES		SPECIAL MEETINGS	
			No. of sessions	Total attendance	No. of sessions	Total attendance	No. of sessions	Total attendance
DELAWARE:								
Bloomville.....	Mrs. J. B. Mattice.....	Dec. 10, 1915	6	155	6	337	.....	.....
Davenport.....	Mrs. J. G. Beasley, Fergusonville.....	Dec. 11, 1915	1	25	1	58	.....	.....
Franklin.....	Mrs. A. O. Potter.....	Dec. 13, 1915	1	22	1	80	.....	.....
Halcoitsville.....	Mrs. G. W. Kelly.....	Dec. 7, 1915	1	33	1	40	.....	.....
Handen.....	Miss Blanche Chambers, R. D., Walton.....	Dec. 15, 1915	1	27	1	49	.....	.....
Hobart.....	Mrs. C. E. Burroughs.....	Dec. 9, 1915	1	31	1	70	.....	.....
			1	17	1	40	.....	.....
DUTCHESS:								
Beekman.....	Mrs. Arthur Holmes, Poughquag.....	Jan. 26, 1916	7	232	7	334	.....	.....
Clinton Corners.....	Miss Clara E. Drum.....	Feb. 1, 1916	1	35	1	48	.....	.....
Moore's Mills.....		Feb. 4, 1916	1	41	1	38	.....	.....
Myers Corners.....	Mrs. Frank Teets, New Hackensack.....	Feb. 3, 1916	1	28	1	36	.....	.....
Pleasant Plains.....	Mrs. J. C. Cockingham, Staatsburg.....	Feb. 5, 1916	1	28	1	46	.....	.....
Pleasant Valley.....	Mrs. Isaac Noxen.....	Feb. 2, 1916	1	60	1	75	.....	.....
Upper Red Hook.....	Mrs. John Kerley, Red Hook.....	Feb. 9, 1916	1	5	1	17	.....	.....
			1	35	1	74	.....	.....
ERIE:								
Akron.....	Mrs. F. C. Eldred.....	Dec. 4, 1915	9	430	9	859	.....	.....
Angola.....	Mrs. B. Davis.....	Dec. 8, 1915	1	70	1	77	.....	.....
			1	50	1	83	.....	.....

Clarence.....	Mrs. Alice Miller, Akron.....	Dec.	3, 1915	1	40	1	89	.....
Crittenden.....	Mrs. G. F. Ayers.....	Dec.	2, 1915	1	30	1	110	.....
Eden Center.....	Mrs. Henry Meyers.....	Dec.	9, 1915	1	28	1	67	.....
Griffins Mills.....	Miss M. E. Dexter, Jewettville.....	Nov.	29, 1915	1	31	1	51	.....
Marilla.....	Mrs. Jennie Longee.....	Dec.	1, 1915	1	80	1	98	.....
Swornville.....	Mrs. Theo. Thering.....	Dec.	6, 1915	1	80	1	194	.....
Williamsville.....	Miss Edith L. Beach, Forks.....	Nov.	30, 1915	1	21	1	90	.....
ESSEX:								
Crown Point.....	Mrs. Mary Stanton.....	Nov.	30, 1915	7	346	7	676	.....
Jay.....	Mrs. Fay Wilmer.....	Dec.	6, 1915	1	110	1	82	.....
Keseville.....	Mrs. Chas. Giddings.....	Dec.	4, 1915	1	42	1	53	.....
Moriah.....	Mrs. Dora Hartwell.....	Dec.	1, 1915	1	50	1	100	.....
Olmstedville.....	Mrs. Walter Hutchins, R. D., Willsboro.....	Oct.	20, 1915	1	42	1	90	.....
Reber.....	Mrs. Wm. Lewis.....	Dec.	3, 1915	1	28	1	95	.....
Wadhams.....		Dec.	2, 1915	1	31	1	46	.....
FRANKLIN:								
Bangor.....	Mrs. R. E. Tarbell, North Bangor.....	Dec.	15, 1915	6	144	6	425	.....
Bombay.....	Mrs. E. R. Blanchard.....	Dec.	17, 1915	1	10	1	40	.....
Brushton.....	Mrs. Herbert M. Aldrich, R. D., North Bangor.....			1	20	1	48	.....
Dickinson Center.....	Mrs. Cora Davidson, Brushton.....	Dec.	20, 1915	1	39	1	76	.....
Gabriels.....	Mrs. J. J. Fitzgerald, Harrietstown.....	Dec.	21, 1915	1	11	1	100	.....
Westville Corners.....	Mrs. Adam Cushman, R. D. 1, Constable.	Dec.	13, 1915	1	38	1	61	.....
			16, 1915	1	26	1	100	.....
GENESEE:								
Alexander.....	Mrs. Earl Kidder.....	Feb.	7, 1916	8	524	8	688	.....
Batavia.....	Mrs. L. C. Higley.....	Feb.	4-5, 1916	1	17	1	44	.....
Bethany.....	Mrs. Chas. Cuthiffe, East Bethany.....	Feb.	8, 1916	1	189	1	34	.....
Byron.....	Mrs. Wm. Fetherbridge.....	Feb.	15, 1916	1	103	1	138	.....
Corfu.....	Mrs. John Wittman.....	Jan.	31, 1916	1	59	1	118	.....
Elba.....	Mrs. Viola Jones.....	Feb.	14, 1916	1	27	1	110	.....
Fort Hill.....	Mrs. Ralph McLean.....	Feb.	1, 1916	1	31	1	77	.....
Pavilion Center.....	Mrs. Chas. Morrow, R. D. 32, Pavilion.....	Jan.	31, 1916	1	54	1	125	.....
				1	44	1	42	.....

TABLE SHOWING RECORD OF SPECIAL WOMAN'S SESSIONS, AND REGULAR INSTITUTE SESSIONS AND SPECIAL MEETINGS ADDRESSED BY WOMEN INSTITUTE WORKERS, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE—Continued

COUNTY AND PLACE	LADY CORRESPONDENT	DATE	SPECIAL WOMEN'S SESSIONS		REGULAR INSTITUTE SESSIONS, MIXED AUDIENCES		SPECIAL MEETINGS	
			No. of sessions	Total attendance	No. of sessions	Total attendance	No. of sessions	Total attendance
GREENE:	Durham.....	Dec. 2, 1916	4	134	4	355	.....	.....
	Freehold.....	Dec. 4, 1916	1	28	1	72	.....	.....
	Halcott Center.....	Dec. 6, 1915	1	27	1	79	.....	.....
	Leeds.....	Jan. 5, 1916	1	43	1	124	.....	.....
	Mrs. John Wilkinson, R. D. 2, Catskill..		1	36	1	80	.....	.....
HERKIMER:	Mrs. Wm. D. Hall.....	Dec. 8, 1915	6	160	6	257	.....	.....
	Mrs. R. C. Lacy.....	Nov. 29, 1915	1	29	1	47	.....	.....
	Miss Deborah Morse.....	Mar. 16, 1916	1	20	1	41	.....	.....
	Mrs. John Wilkinson, R. D. 2, Catskill..	Dec. 6, 1915	1	41	1	77	.....	.....
	Mrs. Louis Firman, R. D. 1, Mohawk....	Dec. 28, 1915	1	19	1	21	.....	.....
	Mrs. James Thompson, Little Falls.....	Nov. 30, 1915	1	20	1	41	.....	.....
	Mrs. O. J. Hoke, R. D. 2, Richfield Spgs..	Dec. 7, 1915	1	31	1	30	.....	.....
	Mrs. L. G. Smith, R. D., Mohawk.....		1					
	Mrs. Eugene Hemstreet, Cold Brook.....		1					
	Mrs. G. E. Davis, Poland.....		1					
JEFFERSON:	Mrs. Cora Tennent.....	Jan. 14-15, 1916	10	311	10	688	9	449
	Mrs. Mary Dillenbeck.....	Jan. 31, 1916	1	43	1	67	.....	.....
	Cape Vincent.....	Dec. 11, 1915	1	51	1	70	2	60
	Carthage.....	Feb. 2, 1916	1		1		2	120
	Champion.....							

Chaumont.....	Mrs. Stella Prior.....	Dec.	21, 1915	1	23	1	31	.....
Clayton.....	Mrs. W. T. Sampson.....	Dec.	15, 1915	1	10	1	30	.....
Depauville.....	Mrs. Charlotte Haas.....	Dec.	20, 1915	1	33	1	103	.....
Great Bend.....	Mrs. George Craig.....	Dec.	14, 1915	1	11	1	21	.....
Lorraine.....	Mrs. F. J. Derby.....	Feb.	3, 1915	.....	.....	.....	.....	140
Natural Bridge.....	Mrs. Anna A. Dempster, R. D. 1, Evans Mills.....	Dec.	13, 1915	1	36	1	67	.....
Panola Four Corners.....	Mrs. Eunice Snell.....	Jan.	11, 1916	1	50	1	125	.....
Perch River.....	Mrs. H. A. Wilder.....	Feb.	4, 1916	.....	.....	.....	.....	34
Plessis.....	Mrs. R. M. Jones.....	Dec.	17-18, 1915	1	23	1	79	.....
Redwood.....	Mrs. Nellie Spaulding.....	Feb.	1, 1916	.....	.....	.....	.....	95
Smithville.....	Mrs. Joseph F. Petzoldt, Beaver Falls.....	Dec.	22, 1915	1	31	1	95	.....
LEWIS:	Mrs. John Mumford.....	Dec.	.....	5	169	5	567	36
Barnes Corners.....	Mrs. F. A. Woodward, R. D. 1, Copenhagen.....	Dec.	8, 1915	1	41	1	75	.....
Copenhagen.....	.....	Dec.	9, 1915	1	36	1	71	.....
Copenhagen.....	.....	June	14, 1916	.....	.....	.....	.....	36
Croghan.....	.....	Dec.	3-4, 1915	1	37	1	325	.....
Glenfield.....	.....	Dec.	6, 1915	1	25	1	29	.....
Harrisburg.....	.....	Dec.	7, 1915	1	30	1	67	.....
LIVINGSTON:	.....	.....	.....	7	313	7	484	1 364
Caledonia.....	Mrs. A. B. Johnson.....	Feb.	9, 1916	1	34	1	74	.....
Conesus.....	Mrs. G. C. McNinch, R. D. 1.....	Feb.	8, 1916	1	34	1	115	.....
Greigsville.....	Mrs. Jennie Allen.....	Feb.	10, 1916	1	60	1	28	.....
Groveland.....	Mrs. W. L. Gamble.....	Feb.	11, 1916	1	37	1	84	.....
Nunda.....	Mrs. Carrie A. Pitts.....	Jan.	26, 1916	1	54	1	68	.....
Sparta Center.....	Mrs. F. M. Shafer, R. D. 2, Dansville.....	Feb.	12, 1916	1	42	1	58	.....
Springwater.....	Mrs. Vinnie Hyde.....	Feb.	7, 1916	1	52	1	57	.....
Dansville.....	J. M. Foster.....	Nov.	16-17, 1915	.....	.....	.....	.....	1 364
MADISON:	.....	.....	.....	11	316	8	384	.....
Brookfield.....	Mrs. Frank Cheseborough.....	Mar.	13-14, 1916	1	42	1	46	.....
Cazenovia.....	Mrs. H. J. Walrath, R. D. 4.....	Dec.	14, 1915	1	4	.....	.....	.....
DeRuyter.....	Mrs. Lettie Richards.....	Mar.	7-8, 1916	1	48			
Eriville.....	Mrs. Theodore Tayntor.....	Dec.	16, 1915	1	19			52

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TABLE SHOWING RECORD OF SPECIAL WOMAN'S SESSIONS, AND REGULAR INSTITUTE SESSIONS AND SPECIAL MEETINGS ADDRESSED BY WOMEN INSTITUTE WORKERS, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE — *Continued*

COUNTY AND PLACE	LADY CORRESPONDENT	DATE	SPECIAL WOMEN'S SESSIONS		REGULAR INSTITUTE SESSIONS, MIXED AUDIENCES		SPECIAL MEETINGS	
			No. of sessions	Total attendance	No. of sessions	Total attendance	No. of sessions	Total attendance
MADISON—Continued								
Fenner.....	Mrs. C. A. Coleman, R. D. 1, Chittinango	Dec. 13, 1915	1	49	1	104	.....	.....
Hamilton.....	Mrs. E. Woodman.....	Dec. 18, 1915	1	16	.....	.....	.....	.....
Hubbardsville.....	Miss Ora Allen.....	Mar. 10, 1916	1	29	1	44	.....	.....
Lebanon.....	Mrs. Adelbert Cole.....	Dec. 17, 1915	1	25	1	42	.....	.....
Madison.....	Mrs. B. L. Bridge, Solsville.....	Dec. 23, 1915	1	9	1	32	.....	.....
New Woodstock.....	Mrs. Floyd Slocum, R. D. 6, 1916	Mar. 6, 1916	1	53	1	14	.....	.....
Stockbridge.....	Mrs. Fred Marshall.....	Dec. 22, 1915	1	21	1	50	.....	.....
MONROE:			10	436	9	812	.....	.....
Churchville.....	Mrs. W. G. McIntosh.....	Feb. 3, 1916	1	27	1	75	.....	.....
Gates.....	Mrs. Mary Neide, Lincoln Park.....	Feb. 2, 1916	1	44	1	84	.....	.....
Greece.....	Mrs. W. E. Jones, Charlotte.....	Feb. 18, 1916	1	42	1	77	.....	.....
Hamlin.....	Mrs. George R. Elliott.....	Feb. 16, 1916	1	25	1	77	.....	.....
Hilton.....	Mrs. Rose Rowley.....	Feb. 17, 1916	1	40	1	90	.....	.....
Mendon.....	Mrs. A. J. Hill, Victor.....	Feb. 28, 1916	1	16	.....	.....	.....	.....
Penfield.....	Miss Cora Weatherlow.....	Feb. 12, 1916	1	30	1	70	.....	.....
Pittsford.....	Mrs. D. J. Howard, East Henrietta.....	Jan. 24, 1916	1	62	1	108	.....	.....
Webster.....	Mrs. George W. Dunn.....	Feb. 25-26, 1916	1	104	1	125	.....	.....
West Henrietta.....	Mrs. W. A. Keyes, Rush.....	Jan. 25, 1916	1	46	1	106	.....	.....

		1915		5	108	5	325		
MONTGOMERY	Canajoharie (Seeber's Lane Grange).....	Dec.	3, 1915	1	28	1	71	.....	.....
	Charleston-Four Corners	Dec.	1, 1915	1	23	1	62	.....	.....
	Italsville.....	Dec.	4, 1915	1	29	1	74	.....	.....
	Minaville.....	Nov.	29, 1915	1	8	1	64	.....	.....
	Rural Grove.....	Dec.	2, 1915	1	20	1	54	.....	.....
	NASSAU:							.....	.....
	Nicola.....	Jan.	25-26, 1916	1	19	.....	.....	.....	.....
	NTAGARA:							.....	.....
	Gasport.....	Feb.	5, 1916	8	441	9	870	.....	.....
	Johnsons Creek.....	Feb.	7, 1916	1	55	1	76	.....	.....
	Newfane.....	Feb.	4, 1916	1	49	1	90	.....	.....
	Pekin.....	Feb.	1, 1916	1	27	1	62	.....	.....
	Pendleton Center.....	Feb.	12, 1916	1	83	1	197	.....	.....
	Ransomville.....	Feb.	2, 1916	1	57	1	90	.....	.....
	Rapids.....	Feb.	2, 1916	1	45	1	65	.....	.....
	Tuscarora Reservation.....	Dec.	7, 1915	1	69	1	166	.....	.....
	Wilson.....	Nov.	19, 1915	.....	.....	1	72	.....	.....
		Feb.	3, 1916	1	56	1	52	.....	.....
	ONEIDA:							.....	17
	Boonville.....	Dec.	2, 1915	6	186	6	442	1	.....
	Bridgewater.....	Mar.	11, 1916	1	12	1	50	.....	.....
	Floyd.....	Dec.	1, 1915	1	35	1	47	.....	.....
	Floyd.....	May	31, 1916	1	26	1	64	.....	.....
	Lee.....	Dec.	10, 1915	.....	.....	.....	.....	1	17
	Vernon Center.....	Dec.	11, 1915	1	22	1	66	.....	.....
	Verona.....	Jan.	27, 1916	1	54	1	105	.....	.....
				1	37	1	110	.....	.....
	ONONDAGA:							.....	.....
	Baldwinsville.....	Jan.	17, 1916	9	299	10	608	.....	.....
	Camillus.....	Jan.	28, 1916	1	47	1	75	.....	.....
	Cicero.....	Jan.	24, 1916	1	13	1	20	.....	.....
				1	55	1	125	.....	.....

TABLE SHOWING RECORD OF SPECIAL WOMEN'S SESSIONS, AND REGULAR INSTITUTE SESSIONS AND SPECIAL MEETINGS ADDRESSED BY WOMEN INSTITUTE WORKERS, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE — *Continued*

COUNTY AND PLACE	LADY CORRESPONDENT	DATE	SPECIAL WOMEN'S SESSIONS		REGULAR INSTITUTE SESSIONS, MIXED AUDIENCES		SPECIAL MEETINGS	
			No. of sessions	Total attendance	No. of sessions	Total attendance	No. of sessions	Total attendance
ONONDAGA — <i>Continued</i>	Mrs. C. B. West.....	Mar. 6, 1916	1	27	1	40	.....	.....
	Mrs. Thomas Kent.....	Jan. 29, 1916	1	34	1	70	.....	.....
	Mrs. W. C. Newell.....	Mar. 8, 1916	1	32	1	37	.....	.....
	Mrs. G. F. Butts.....	Mar. 15, 1916	1	35	.....	.....	.....	.....
	Mrs. D. D. F. Dorchester.....	Mar. 9, 1916	1	18	1	37	.....	.....
	Mrs. C. R. Smith.....	Mar. 13, 1916	.....	.....	2	114	.....	.....
	Mrs. A. E. Ellis, R. D. 3.....	Mar. 7, 1916	1	38	1	90	.....	.....
	.....	.....	8	382	7	636	.....	.....
	Mrs. G. F. Wheaton.....	Mar. 1, 1916	1	50	.....	.....	.....	.....
	Mrs. J. K. Haire, R. D.	Feb. 29, 1916	1	37	1	47	.....	.....
ONTARIO:	Canandaigua.....	Mar. 8, 1916	1	55	1	80	.....	.....
	Naples.....	Mar. 17, 1916	1	46	1	60	.....	.....
	Phelps.....	Feb. 2, 1916	1	55	1	101	.....	.....
	Reeds Corners.....	Mar. 2, 1916	1	33	1	125	.....	.....
	Seneca Castle.....	Mar. 9, 1916	1	77	1	130	.....	.....
	Victor.....	Feb. 16, 1916	1	29	1	93	.....	.....
	West Bloomfield.....	Feb. 21, 1916	1	.....	1	.....	.....	.....

ORANGE:									
Amity.....	Mrs. Robert J. Doty.....	Jan.	14, 1916	8	193	8	416	.....	.....
Bainville.....	Miss N. C. Barnes, R. D., Newburg.....	Jan.	20, 1916	1	11	1	28	.....	.....
Brookside.....	Mrs. C. O. Warford, R. D., Newburg.....	Jan.	19, 1916	1	26	1	55	.....	.....
Bullville.....	Mrs. Charles R. Mills, R. D., Middletown.....	Jan.	12, 1916	1	32	1	68	.....	.....
Florida.....	Mrs. Katherine Sturr.....	Jan.	15, 1916	1	25	1	50	.....	.....
Port Jarvis.....	Mrs. C. J. Van Inwegen, Huguenot.....	Jan.	11, 1916	1	5	1	28	.....	.....
Unionville.....	Mrs. M. B. Stoll.....	Jan.	13, 1916	1	18	1	40	.....	.....
Walden.....	Mrs. Stanley Mills.....	Jan.	22, 1916	1	51	1	108	.....	.....
				1	25	1	39	.....	.....
				5	187	6	572	.....	.....
ORLEANS:									
Clarendon.....	Mrs. Grant Orcott, R. D. 2, Holly.....	Feb.	11, 1916	.....	.....	2	89	.....	.....
East Shelby.....	Mrs. B. C. Roberts, Medina.....	Feb.	9, 1916	1	48	1	123	.....	.....
Kendall.....	Mrs. Anna Burke.....	Feb.	15, 1916	1	35	1	135	.....	.....
Knowlesville.....	Mrs. Carrie Whiting, R. D., Albion.....	Feb.	10, 1916	1	45	1	150	.....	.....
Lyndonville.....	Mrs. T. H. Nic.....	Feb.	14, 1916	1	40	1	75	.....	.....
Medina.....	Mrs. W. J. Balch.....	Feb.	8, 1916	1	19	.....	.....	.....	.....
				11	518	11	1 087	69	.....
OSWEGO:									
Altmar.....	Miss Bertha Pratt, R. D. 1,.....	Jan.	12, 1916	1	24	1	74	.....	.....
Bernhards Bay.....	Mrs. Mabel Myers.....	Jan.	26, 1916	1	58	1	90	.....	.....
Central Square.....	Mrs. C. B. Allen.....	Jan.	25, 1916	1	101	1	190	.....	.....
Fulton.....	Miss Mabel Churchill.....	Jan.	21-22, 1916	1	40	1	98	.....	.....
Hanibal.....	Mrs. E. L. Gardener.....	Jan.	21-22, 1916	1	125	1	240	.....	.....
Lacona.....	Mrs. M. J. Upton, Sandy Creek.....	Dec.	23, 1915	1	26	1	10	.....	.....
Lacona.....	Mrs. M. J. Upton, Sandy Creek.....	June	13, 1916	.....	.....	.....	.....	69	.....
Mt. Pleasant.....	Mrs. Charles Parker, R. D., Fulton.....	Jan.	19, 1916	1	36	1	93	.....	.....
North Scriba.....	Mrs. O. H. Cornwell, R. D. 1, Oswego.....	Jan.	18, 1916	1	7	1	72	.....	.....
Orwell.....	Miss Bernice DeLong, R. D., Richland.....	Jan.	13, 1916	1	31	1	84	.....	.....
Palermo.....	Mrs. Earl Hill, R. D., Fulton.....	Jan.	20, 1916	1	45	1	87	.....	.....
Williamstown.....	Mrs. E. N. Harris.....	Dec.	9, 1915	1	25	1	49	.....	.....
				9	242	9	612	.....	.....
OTSEGO:									
Burlington.....	Mrs. Lillie Klock.....	Dec.	21, 1915	1	30	1	97	.....	.....
East Springfield.....	Mrs. A. I. Branch.....	Dec.	23, 1915	1	18	1	55		
Elk Creek.....	Miss Janella Cole.....	Mar.	16, 1916	1	18	1	40		

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COUNTY AND PLACE	LADY CORRESPONDENT	DATE	SPECIAL WOMEN'S SESSIONS		REGULAR INSTITUTE SESSIONS, MIXED AUDIENCES		SPECIAL MEETINGS	
			No. of sessions	Total attendance	No. of sessions	Total attendance	No. of sessions	Total attendance
OTSEGO — <i>Continued</i>	Milford.....	Dec. 17, 1915	1	19	1	86	....	.....
	New Lisbon.....	Dec. 20, 1915	1	34	1	95	....	.....
	Otego.....	Dec. 16, 1915	1	18	1	59	....	.....
	Pierstown.....	Dec. 18, 1915	1	28	1	55	....	.....
	West Exeter.....	Dec. 22, 1915	1	26	1	35	....	.....
WORCESTER	Mrs. L. C. Miles.....	Dec. 28, 1915	1	51	1	90	....	.....
	Mrs. Elizabeth Burlingame.....							
PUTNAM:	Mrs. Alice D. Hovey, R. D. 1, Coopers-town.....							
	Mrs. Charles J. Armstrong.....							
	Mrs. Amy Barton, Mt. Vision.....							
ADAMS CORNERS	Mrs. Henry G. Silleck, Star Route, Tompkins Corners.....	Jan. 25, 1916	3	112	3	237	....	.....
	Mrs. M. A. Crane, R. D., Carmel.....	Jan. 28, 1916	1	33	1	130	....	.....
	Mrs. Carrie Iver.....	Jan. 27, 1916	1	25	1	17	....	.....
MAHOPAC				54	1	90	....	.....
RENSSELAER:	Mrs. Wm. Cottrell.....	Feb. 18, 1916	5	175	5	340	....	.....
	Johnsonville.....	Feb. 19, 1916	1	45	1	100	....	.....
	Melrose.....		1	28	1	54	....	.....

Raymertown.....	Miss Nellie Sherman, Melrose.....	Mar.	2, 1916	1	43	1	63	.....
Stephentown.....	Mrs. H. D. Osgood.....	Mar.	17, 1916	1	37	1	43	.....
Wynantskill.....	Mrs. Frank Wicks, R. D. 2.....	Mar.	3, 1916	1	22	1	80	.....
ROCKLAND:								
Tallmans.....	Mrs. T. Springsteen.....	Jan.	17-18, 1916	1	34	1	27	.....
				1	34	1	27	.....
ST. LAWRENCE:				12	483	10	909	43
Brier Hill.....	Mrs. Clark Rogers.....	Dec.	16, 1915	1	68	1	140	.....
Brier Hill.....	Mrs. Clark Rogers.....	June	12, 1916	.....	.....	.....	.....	43
Crary Mills.....	Mrs. Roy Brown, Pierrepont.....	Jan.	10, 1916	1	41	1	88	.....
DeKalb Junction.....	Mrs. A. W. Farr.....	Jan.	7, 1916	1	49	1	85	.....
DePeyster.....	Mrs. Everett Blair, Heuvelton.....	Jan.	8, 1916	1	78	.....	.....	.....
Fine.....	Mrs. J. P. Griffin, Oswegatchie.....	Dec.	10, 1915	1	35	.....	.....	.....
Lawrenceville.....	Mrs. Anna T. Harmon.....	Jan.	3, 1915	1	23	.....	74	.....
Madrid.....	Miss Hazel I. Crump.....	Jan.	6, 1915	1	26	1	120	.....
Massena.....	Miss S. Howard.....	Dec.	18, 1915	1	13	1	49	.....
Nicholville.....	Mrs. C. D. Babcock.....	Dec.	22, 1915	1	27	1	103	.....
Norfolk.....	Mrs. Herbert Wilber, Norwood.....	Jan.	5, 1916	1	6	1	12	.....
Parishville.....	Mrs. Ida McCarty.....	Dec.	23, 1915	1	50	1	58	.....
Winthrop.....	Mrs. W. C. Smith.....	Jan.	4, 1916	1	67	1	180	.....
SARATOGA:				6	189	5	398	.....
Charlton.....	Mrs. Bert Conde, R. D. 2, Schenectady.....	Mar.	8, 1916	1	22	.....	.....	.....
Clifton Park Center.....	Mrs. A. L. March, Elnora.....	Mar.	6, 1916	1	27	1	64	.....
Edinburg.....	Miss Ruby M. Lawton.....	Oct.	22, 1915	1	27	1	83	.....
Galway.....	Mrs. Richard M. Carter.....	Mar.	7, 1916	1	65	1	132	.....
Gurn Spring.....	Mrs. George B. Eddy, Gansevoort.....	Feb.	28, 1916	1	24	1	54	.....
Malta.....	Mrs. Wm. Bathrick, R. D., Ballston Spa.....	Feb.	29, 1916	1	24	1	65	.....
SCHEENECTADY:				1	51	1	70	.....
Braman Corners.....	Mrs. Chas. M. Howe, R. D. 1, Amsterdam.....	Nov.	30, 1915	1	51	1	70	.....
SCHOHARIE:				5	99	6	297	.....
Broome Center.....	Mrs. Hobart Mace, R. D. 1, Gilboa.....	Dec.	1, 1915	1	18	1	60	.....
Fultonham.....	Mrs. J. C. Bouck, Middleburg.....	Nov.	30, 1915	.....	.....	1	39	.....

TABLE SHOWING RECORD OF SPECIAL WOMEN'S SESSIONS, AND REGULAR INSTITUTE SESSIONS AND SPECIAL MEETINGS ADDRESSED BY WOMEN INSTITUTE WORKERS, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE — *Continued*

COUNTY AND PLACE	LADY CORRESPONDENT	DATE	SPECIAL WOMEN'S SESSIONS		REGULAR INSTITUTE SESSIONS, MIXED AUDIENCES		SPECIAL MEETINGS		
			No. of sessions	Total attendance	No. of sessions	Total attendance	No. of sessions	Total attendance	
SCHOHARIE — Continued									
Gallupville.....	Mrs. E. A. Schoolcraft, R. D. 2, Schoharie	Nov. 29, 1915	1	12	1	64	.....	.....	
Hyndsville.....	Mrs. George Vrooman.....	Dec. 29, 1915	1	3	1	23	.....	.....	
Jefferson.....	Mrs. J. H. Hartwell.....	Dec. 8, 1915	1	54	1	64	.....	.....	
Sharon Springs.....	Mrs. Wm. M. Kling.....	Dec. 30, 1915	1	12	1	47	.....	.....	
SCHUYLER:			6	249	6	496	.....	.....	
Beaver Dams.....	Mrs. A. J. Moore.....	Feb. 23, 1916	1	29	1	115	.....	.....	
Burdett.....	Mrs. Floyd Barrett.....	Feb. 25, 1916	1	66	1	87	.....	.....	
Catherine.....	Mrs. E. B. Winton, Montour Falls.....	Feb. 24, 1916	1	36	1	46	.....	.....	
Moreland.....	Mrs. Wm. Kendall, R. D. 4, Watkins.....	Feb. 22, 1916	1	25	1	82	.....	.....	
Townsend.....	Mrs. J. E. Waugh, R. D. 2, Watkins.....	Feb. 19, 1916	1	40	1	62	.....	.....	
Tyrone.....	Mrs. C. Cole, R. D., Watkins.....	Feb. 21, 1916	1	53	1	104	.....	.....	
SENECA:			2	80	2	129	.....	.....	
Covert.....	Mrs. J. H. Godfrey, R. D., Trumansburg.	Feb. 26, 1916	1	30	1	82	.....	.....	
Seneca Falls.....	Mrs. Fred Long.....	Mar. 10-11, 1916	1	50	1	47	.....	.....	

STREUBEN:		11	659	11	1	123	...
Atlanta.....	Mrs. C. J. Gray, No. Cohocton.....		3, 1916				
Bath.....	Mrs. James Little.....	1	14	1	75	...	
Big Creek.....	Mrs. Helen Franklin.....	1	52	1	70	...	
Canisteo.....	Mrs. A. B. Stephens, R. D. 1.....	1	51	1	80	...	
Cohocton.....	Mrs. Chas. Wittig.....	1	18	1	62	...	
Ingleside.....	Mrs. C. P. Stanton, R. D., Cohocton.....	1	64	1	183	...	
North Urbana.....	Mrs. J. F. Barclay.....	1	66	1	125	...	
Prattsburg.....	Mrs. M. J. Ward.....	1	50	1	79	...	
Savona.....	Mrs. C. Zimmerman, R. D. 3, Arkport.....	1	150	1	120	...	
Stephens Mills.....	Miss Mary Gunn.....	1	25	1	28	...	
Troupsburg.....		1	39	1	85	...	
		1	130	1	216	...	
SUFFOLK:							
Bridgehampton.....	Miss Nettie White, Sagaponack.....	2	62	3	262	5	158
Brookhaven.....		1	34	1	125	1	20
Patchogue.....		...	...	...	...	4	138
Port Jefferson Station.....	Miss S. K. Murphy.....	1	28	1	76	...	
*Sound Avenue.....	Mrs. H. J. Wells, Sound Ave., Riverhead.....	...	...	...	...	...	
*Southold.....	Miss Florence Beebe.....	...	...	...	...	...	
Yaphank.....	Mrs. August von Hasse.....	...	...	1	61	...	
SULLIVAN:							
Bloomington.....	Mrs. Ed. H. Mills.....	6	173	5	348	...	
Hurleyville.....	Mrs. Fred Mitten.....	1	28	1	76	...	
Jeffersonville.....	Mrs. Ralph Myers.....	1	24	1	58	...	
Lake Huntington.....	Mrs. Otis F. Oken.....	1	35	1	67	...	
Rock Hill.....	Mrs. Robert Davies.....	1	27	1	74	...	
Shandeele.....	Mrs. Win. Sexton, R. D., Livingston Manor.....	1	27	...	...	...	
		1	32	1	73	...	
TIOGA:							
Apalachin.....	Mrs. S. H. Oran.....	6	359	5	568	...	
Newark Valley.....	Miss Mayfred Stoughton.....	1	88	1	203	...	
Nichols.....	Mrs. W. H. Clark.....	1	68	1	103	...	
		1	75	1	146	...	

* Meeting arranged for; speaker unable to be present

TABLE SHOWING RECORD OF SPECIAL WOMEN'S SESSIONS, AND REGULAR INSTITUTE SESSIONS AND SPECIAL MEETINGS ADDRESSED BY WOMEN INSTITUTE WORKERS, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE — *Continued*

COUNTY AND PLACE	LADY CORRESPONDENT	DATE	SPECIAL WOMEN'S SESSIONS		REGULAR INSTITUTE SESSIONS, MIXED AUDIENCES		SPECIAL MEETINGS	
			No. of sessions	Total attendance	No. of sessions	Total attendance	No. of sessions	Total attendance
Tioga — <i>Continued</i>	North Barton		1	29				
	Spencer	Feb. 18, 1916	1	75	1	78		
	Waverly	Feb. 21, 1916	1	24	1	38		
	Mrs. George Doney, R. D.	Feb. 19, 1916						
TOMPKINS:			4	106	3	187		
	East Lansing	Mar. 1, 1916	1	30	1	50		
	Groton	Jan. 12, 1916	1	35	1	65		
	Speedsville	Jan. 11, 1916	1	20	1	72		
	West Groton	Mar. 2, 1916	1	21				
			5	145	5	324	2	17
ULSTER:			1	17	1	28		
	Gardenier	Jan. 21, 1916	1	17	1	28		
	Mt. Marion	Jan. 7, 1916	1	24	1	79		
	Napanoch	Jan. 8, 1916	1	14	1	31		
	*New Paltz	Feb. 7, 1916						
	New Paltz	Feb. 7, 1916						
	Ulster Park	June 8, 1916						
	Ulster Park	Feb. 7, 1916	1	35	1	70	2	17
	Woodstock	Jan. 6, 1916	1	55	1	116		
	Mrs. George Riseley	Jan. 6, 1916						

		3	96	3	229	4	135
WARREN:	.....	19, 1915	1	1	44	.....	.....
	Chestertown.....	Oct.	1	1	101	.....	.....
	Queensbury.....	Oct.	1	1	84	.....	.....
	Wewertown.....	Oct.	1	1	.....	.....	.....
WASHINGTON:	.....	24, 1916	7	4	342	4	135
	Mrs. Orley McAuley.....	Feb.	1	1	146	.....	.....
	Mrs. George Potter.....	Feb.	1	1	65	.....	.....
	Cambridge.....	Mar.	1	1	100	.....	.....
	Miss Mary Potter, Greenwich.....	1, 1916	1	1	.....	.....	.....
	Miss Mary Potter, Greenwich.....	June	.....	.....	.....	2	52
	Mrs. Julia Norton.....	2, 1916	1	.....	.....	.....	.....
	Mrs. Julia Norton.....	25, 1916	.....	.....	.....	.....	.....
	Mrs. J. R. Middleton.....	June	.....	.....	.....	2	83
	Mrs. G. E. Dederick, Putnam Station.....	Feb.	1	1	31	.....	.....
	Mrs. J. W. Johnston.....	29, 1915	1	.....	.....	.....	.....
	Mrs. J. W. Johnston.....	22, 1916	1	.....	.....	.....	.....
	Mrs. Joseph McElroy, R. D., Salem.....	Feb.	1	.....	.....	.....	.....
	.....	23, 1916	1	.....	.....	.....	.....
WAYNE:	.....	18, 1916	7	7	538	.....	.....
	Mrs. Emily Thompson.....	Jan.	1	1	100	.....	.....
	Mrs. Clara Barker, Macedon.....	Feb.	1	1	88	.....	.....
	Mrs. Frank Brown.....	Feb.	1	1	85	.....	.....
	Miss Ada Slocum.....	24-25, 1916	1	1	45	.....	.....
	Mrs. W. E. Hall.....	Jan.	1	1	58	.....	.....
	Mrs. P. R. Fairbanks.....	23, 1916	1	1	117	.....	.....
	Mrs. Judd Clark.....	Jan.	1	1	45	.....	.....
	.....	19, 1916	1	1	.....	.....	.....
	.....	.....	1	1	40	.....	.....
WESTCHESTER:	.....	24, 1916	1	1	40	.....	.....
	Cortlandt Grange.....	Jan.	1	1	.....	.....	.....
WYOMING:	.....	7, 1916	7	7	775	.....	.....
	Mrs. C. H. Newman, Sandusky.....	Jan.	1	1	81	.....	.....
	Mrs. Lena Fuller, R. D. 2.....	Jan.	1	1	100	.....	.....
	Mrs. Hartie Reilein.....	Feb.	1	1	140	.....	.....
	Mrs. Belle Taylor, Ganesville.....	Jan.	1	1	137	.....	.....
	Miss May Kimbell.....	Feb.	1	1	52	.....	.....

* Meeting arranged for; speaker unable to be present

TABLE SHOWING RECORD OF SPECIAL WOMEN'S SESSIONS AND REGULAR INSTITUTE SESSIONS AND SPECIAL MEETINGS ADDRESSED BY WOMEN INSTITUTE WORKERS, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE — *Concluded*

COUNTY AND PLACE	LADY CORRESPONDENT	DATE	SPECIAL WOMEN'S SESSIONS		REGULAR INSTITUTE SESSIONS, MIXED AUDIENCES		SPECIAL MEETINGS	
			No. of sessions	Total attendance	No. of sessions	Total attendance	No. of sessions	Total attendance
WYOMING — <i>Continued</i>	Miss Lillian Stryker, Java Village.....	Feb. 9, 1916	1	75	1	163		
	Mrs. Charles Corwin.....	Jan. 29, 1916	1	60	1	102		
YATES:	Mrs. Emma Beattie.....	Mar. 3-4, 1916	4	127	4	359		
	Mrs. A. H. Clapper.....	Feb. 18, 1916	1	28	1	109		
	Mrs. Herbert Foster, R. D., Rushville.....	Mar. 7, 1916	1	18	1	42		
	Miss Mary Phelps.....	Mar. 6, 1916	1	66	1	190		
			1	15	1	18		
Totals.....			346	13 305	330	25 798	44	2 888

RECAPITULATION OF WOMEN'S WORK

June 15, 1915, to June 30, 1916, inclusive

	Number sessions	Total attendance
Special women's sessions.....	346	13,305
Regular sessions, mixed audiences.....	330	25,798
Special meetings	44	2,888
Totals	720	41,991

LEARNING TO READ

MRS. ORRA PARKER PHELPS

Farmers' Institute Lecturer

Although reading heads the list of the "three R's" upon which our whole system of education is built, yet in these days of intense living, when the world's latest news is handed to us fresh every hour, hastily written because it is to be hastily read, there is danger that reading will become a lost art — not that we will cease to peruse the printed page, but that we will lose the power to read thoroughly; to taste the flavor of the author's wit; to appreciate his choice of words; to follow his line of thought to its logical conclusion.

In order that as a people we may not lose this wonderful power of benefiting by the years of study and research of another, of walking with him as he wanders in lands we can never hope to see, of heeding the life lessons he learned — all set forth in well-written biographies — we must choose books carefully, especially when selecting them for children. It is a delicate and difficult task to select the most suitable books for the foundation of the child's literary taste. On the one hand is the desire of the mature mind to insist upon books of a serious type; on the other, the very human distaste of the child at being told that he must, or ought, to read these books. Happy and fortunate indeed is the child born of book-loving parents into a home where he has access to the best books from his youth up. A child exposed to good reading is sure to "catch it"; and, unlike other things that are "catching," he never gets over it.

In selecting books for children it is well to remember that a normal child demands quite different types of stories, told or read, as he develops. The first interest a child shows in books is in looking at the pictures. Before he can talk plainly he will be

interested in pictures of other children and of animals, and will listen to simple stories about them. Let the first pictures shown to the child be accurate ones. Can you believe that a child, seeing an elephant for the first time, was bitterly disappointed because it did not wear a ruff about its neck and walk on its hind legs as did the pictured elephant in her nursery book? The child depends on us for truth — let us give him true concepts of the world beyond his little sphere.

While still very young, the rhythm of that time-honored classic, "Mother Goose," will appeal to children. They love the jingles and will pore over the crude pictures with delight. I know of one child who early learned the rhymes and actually taught herself to read by fitting the spoken word to the printed page. Give the children Mother Goose, by all means. It gives them a sense of rhythm, trains their imagination, and teaches many a wholesome lesson. The preface from one of the earliest editions is prophetic, for at the end is this couplet:

"No, no, my melodies will never die,
While nurses sing or babies cry."

There is a series of books, called "the Little Black Sambo books," written by a mother in India to amuse her own children on the long, tedious journeys they must take. The drawings are of the crudest, the text a mere nothing, yet they have great charm for children, especially if told why they were written. They arouse an interest in the children of other lands, and perhaps pave the way to a joy in geography.

When the children are interested in stories of animals, choose those in which animals are depicted as acting like animals and not like naughty humans. Fairy tales should have a place in every child's reading; and, if at all imaginative, he will people his own haunts with the wee folk and weave tales of his own. Seldom is there any danger of overstimulating the imagination. A well-trained imagination is one of the best assets for a successful and happy life. With the fairy tales come the myths and the legends that are so woven into the best of our literature. Put within reach of the child the "Wonder Book" and "Tanglewood Tales," and "The Princess and the Goblins" and "The Princess and Curdie" — two tales which are really allegories; read with him "Water-Babies," and see if you, too, do not learn a lesson

from Mrs. Bedonebyasyoudid; the folk lore of the Indian should not be forgotten, and the "Wigwam Stories" will surely appeal to every child; Uncle Remus, with his wonderful tales, should be a family friend; "Arabian Nights," "The Wonderful Adventures of Nils" — all of these are excellent.

Stories of other children are always interesting if they are genuine. Children are keen to detect any false note, and books that are written because a grown-up thinks the child ought to be interested in his tale are seldom chosen by the child himself.

There is often the complaint that children do not like history, and small wonder, if their introduction to it is in the school room! But if the way has been paved for it by stories of Robin Hood, Otto of the Silver Hand, Merrylip, Puck o'Pooks Hill, The Little Duke, by stories of early England, and by the books about the children that were carried away captive by the Indians at the time of the Deerfield Massacre, history will become a living and breathing subject instead of dry, rattling bones of dates and succession of kings.

Stories of adventure are necessary to give expression to fighting and rivalry instincts. The boy — and perhaps the girl — must have opportunity to roam untrammelled and free, to mount the blood-stained deck, and to strike terror into the souls of his captives; but let him do it through "Treasure Island" and "Black Arrow," the stories of Cooper and Doyle, rather than through the pages of lesser writers.

Walter Prichard Eaton called attention not long ago to the lamentable fact that books of the dime-novel type were being printed and sold for fifty cents. A person unskilled in book-buying is liable to think, in these days of cheap editions, that a book for which he pays fifty cents must be all right. Far from it, oftentimes. Be sure to know that the book you place in the hands of the boy is genuine. Do not let him read the unwholesome book. It is not enough that the book be negative — it should stand for something worth while.

The natural boy dreams of other lands than ours; by all means let him go with Du Chaillu to the Land of the Long Night and to the Land of the Dwarfs. Let him go with Shackleton to the Pole and let him wander in the Land of Mystery — that remarkable, true

story of adventure in Egypt; let him go with Franck on his "Vagabond Journey around the World" and on his search for experiences strange as "Zone Policeman 88." "The Land of Little Rain," by Mary Austin, will give a good idea of a bit of our western land; and "A Bird Lover in Mexico" will teach him many things about both birds and country. The many books which are written for both boys and girls about school life cannot fail to attract and to serve their purpose. One story of school life stands as a classic—"Tom Brown."

Unfortunately, the books for girls incline more to the sentimental. Yet, sentiment has its place. The love story has been condemned; but now, knowing that it is necessary, we try merely to place in the hands of the lads and lassies the wholesome books of love. I was much impressed by the remark of a college girl that if both boys and girls could read such books as "The Crimson Sweater," "Harry's Island," and "Tom, Dick, and Harriet," where the true comradely relations of the growing boys and girls were sketched in an attractive story, there would be far less demand for the extremely sentimental story. Probably no finer love story is read today than "Lorna Doone," a book perhaps little appreciated by those who read it as part of the required reading of the school, yet fine and true in every line. "Mother Carey's Chickens," "The Sign of the Fox," and the short stories by Henry Van Dyke and by Mary Andrews, are all good. For this age it is far better to read a love story pure and simple, where all goes well and they are married and live happily ever after, than to read the more profound work which introduces social problems and shows us many evils, without really satisfactorily solving them.

Throughout childhood and youth there should be a constant opportunity for the child to read poetry. After "Mother Goose" will come the poems by Eugene Field and Stevenson. Oliver Wendell Holmes will delight with his quaint humor. Longfellow's "Saga of King Olaf" will appeal to the lover of the adventurous, as will Tennyson's "Defence of Lucknow."

What has been said applies especially to the young, for it is in youth that the reading habit is formed. If a person has not a taste for good reading before he is thirty, he rarely acquires it. The mature reader has learned that there are some books he outgrows, while others grow with him; his library will perhaps be

small, yet chosen with great care. He selects books mainly along the lines that especially interest him, buying books on science if he desires to know what life is. Should he wish to know the meaning of life, he studies books on philosophy and religion; while if he wishes to know how life may be intensified he selects books of romance. There is little to be suggested to the mature reader whose tastes are fixed, but to those who have read omnivorously with no especial aim, and wish to undertake special reading, it may be well to suggest that the more elementary books along the chosen line be undertaken first, possibly a school textbook. This is especially helpful if one is undertaking scientific reading where technical terms must be understood before the text can be appreciated. And a second suggestion is that "all novels may be divided into two great classes — those that make us think and those that keep us from thinking," and that each class may have its place. When a person is perplexed and troubled, the reading of a short story whose aim is merely to amuse may rest the mind so that after the reading it is in a better state to grasp and solve its problems. But, usually, it is better to read the book that gives food for thought.

I am unwilling to leave the subject of books without making direct reference to the masterpiece of the ages — the Bible. And that my words may have more weight, I will quote from a recent article by Hon. James Bryce. He says: "Viewed from a literary standpoint it stands alone, both from its antiquity and variety of contents. Its prose narrative is direct, terse, exact, yet imaginative. Its stories have a vivid quality modern pens cannot produce. It contains war songs like the songs of Miriam and Moses and Deborah and Barak, and meditative and devotional poems as in the psalms and prophets. There is a philosophic tinge in the strange drama of Job, where the Hebrew mind reaches its highest level of sustained poetic power. It is full of imagination, warmth, power, and weird sublimity. Although more than two thousand years old, it is still fresh, because it touches the primitive feelings of faith and fervor." He further says that "the Bible is a model of pure, simple, melodious English which should be doubly precious to us in these days."

The neglect of Bible reading may trace back to the long Puritan Sabbaths where children were compelled to hear it read by rote

with no comment and to learn long chapters; but I am confident that no person who, as a child, has heard the Bible stories lovingly told by father or mother and has had as an especial Sabbath treat the privilege of looking at the pictures and reading the stories in the big family Bible has ever come to the time when he found Bible reading wearisome. It belongs to all ages, to all times.

It may perhaps not be amiss to refer briefly to a few of the excuses that people make for not reading. We hear people say, "But books are so expensive, we cannot afford them." This is no longer strictly true. Good books are being published at prices that put them within the reach of every one. The only case I can think of where books are too great an expense is when a person buys a book of the hour, and the hour passes. Within the last few years there have been put upon the market nearly eight hundred of the best books of the world at the very low cost of thirty-five cents per volume. And the list contains books suitable for children and grown-ups, for the story lover and the man of scientific mind. If one feels that he cannot afford to buy, let him write to the State Library at Albany and find out if it may not be possible for him to arrange for one of the circulating libraries to come into his neighborhood or his grange, and by so doing provide books, not only for those of his own house, but for his neighbor. Merely the cost of transportation will bring a library of fifty books, which may be retained for three months and then exchanged for another set.

There is also the excuse of lack of time. If a person really wants to do a thing, he will contrive to find the time for it. By a little care and thought, time can be found for reading. I have known a busy woman to keep a book in the kitchen and take a peep at it as a stray second came her way. Another booklover had a rack made over her kitchen sink, which did not give her, through a window, an outlook beyond the dishpan, and in this rack she slipped an open book and read as she worked. This is a good check to a tendency to read too rapidly.

In "Adventures in Contentment" is this sentiment: "There should be in every farm home, along with the other implements, a shelf of good books that are not allowed to grow rusty with disuse." Place on this shelf a good dictionary; a simple book of

geology, which shall help the children to know how soils are formed; a guide to the flowers and trees; a book about birds and one about insects, as well as standard books of history and literature.

If we are to keep our country homes up to the high standard set by our forefathers, we must believe in the country and teach our children to believe in the country, as they did. And when we put into the children's hands books that shall open their eyes to the wonders of the country, we shall have gone a long way toward fostering that love.

LIST OF FARMER'S INSTITUTE WORKERS, JUNE 15, 1915, TO JUNE 30, 1916, INCLUSIVE

DIRECTOR OF FARMERS' INSTITUTES

Edward van Alstyne

In Charge of Meetings

William Hotaling, Kinderhook.	Jared Van Wagenen, jr., Lawyerville.
Roy P. McPherson, Le Roy.	C. R. White, Ionia.
A. J. Nicoll, Delhi.	D. P. Witter, Berkshire.

REGULAR LECTURERS WITH DATES OF SERVICE

Bonsteel, F. E., Ashville.....	Nov. 29, 30; Dec. 1-23; Jan. 3-31; Feb. 1-29; March 1-16.
Cook, I. C. H., South Byron.....	Nov. 29, 30; Dec. 1-4, 20-23; Feb. 5, 24-26; March 16.
Dexter, Dr. Wm. Hart, Jewettville..	Nov. 29, 30; Dec. 1-23; Feb. 2.
Hamilton, Dr. M., Delhi.....	Nov. 29, 30; Dec. 1-23; Jan. 3-31; Feb. 1-29; March 1-16, 22; June 9.
Harrington, Mrs. Ida S., Albany....	Nov. 8-10, 16-19, 29, 30; Dec. 1-23; Jan. 3-31; Feb. 1-5, 23-29; March 1-16, 23.
Heaton, Dr. Lucia E., Canton.....	Nov. 29, 30; Dec. 1-18; Jan. 3-31; Feb. 1-29; March 1-16.
Henry, Forest, Dover, Minn.....	Jan. 3-31; Feb. 1-29; March 1-16.
Hotaling, William, Kinderhook.....	Aug. 27, 28; Oct. 18-22; Nov. 20, 29, 30; Dec. 1-23, 27-30; Jan. 3-31; Feb. 1-29; March 1-16; April 28, 29; May 1-6.
Jones, Mrs. Della A., Worcester.....	Sept. 2; Oct. 18-22; Nov. 29, 30; Dec. 1-23; Jan. 10-31; Feb. 1-29; March 1-16; June 9.
Jones, Miss Jennie C., Paris.....	Dec. 1, 20-23, 27-30; Jan. 3-8; Feb. 24-26; March 15, 16; June 17.
McPherson, Roy P., Le Roy.....	Nov. 19, 29, 30; Dec. 1-23; Jan. 3-31; Feb. 1-29; March 1-16.
Monroe, Mrs. Geo. E., Dryden.....	Nov. 29, 30; Dec. 1-23; Jan. 3-31; Feb. 1-29; March 1-16.
Nicoll, A. J., Delhi.....	Aug. 27; Sept. 4; Nov. 6, 29, 30; Dec. 1-23; Jan. 3-31; Feb. 1-29; March 1-16, 24; April 8, 9, 15.

Phelps, Mrs. Orra P., Canton.....	Nov. 16-18, 29, 30; Dec. 1-23, 28; Jan. 17-31; Feb. 1-4, 8-25; March 16.
Santee, Dr. E. M., Cortland.....	Nov. 29, 30; Dec. 1-23; Jan. 3-31; Feb. 1-29; March 1-16.
Van Wagenen, Jared, jr., Lawyersville	July 10; Aug. 4, 14, 17, 20; Sept. 14; Nov. 8; Dec. 8, 27-30; Jan. 17-26; Feb. 8, 23-25; March 21-23, 31; April 12; June 9.
White, C. R., Ionia.....	Nov. 29, 30; Dec. 1-23; Jan. 3-31; Feb. 1-29; March 1-16; April 7.
Witter, D. P., Berkshire.....	Aug. 27; Nov. 29, 30; Dec. 1-23, 28; Feb. 4, 5; March 4.

LECTURERS FROM STATE DEPARTMENT OF AGRICULTURE

- A. B. Buchholz, Nursery Inspector, Albion, N. Y.
 Dr. J. F. DeVine, Consulting Veterinarian, Goshen, N. Y.
 Geo. L. Flanders, Counsel, Albany, N. Y.
 H. C. Sands, Pathologist, Bureau of Plant Industry, Albany, N. Y.
 L. F. Strickland, Nursery Inspector, Lockport, N. Y.
 B. D. Van Buren, Assistant Chief, Bureau of Plant Industry, Albany, N. Y.

LECTURERS FROM STATE COLLEGE OF AGRICULTURE

- M. F. Barrus, Extension Professor of Plant Pathology, Ithaca, N. Y.
 W. H. Chandler, Research Professor of Pomology, Ithaca, N. Y.
 E. O. Fippin, Professor of Soil Technology, Ithaca, N. Y.
 B. T. Galloway, Dean, Ithaca, N. Y.
 W. G. Krum, Assistant and Superintendent in Poultry Husbandry, Ithaca,
 N. Y.
 E. G. Montgomery, Professor of Farm Crops, Ithaca, N. Y.
 Donald Reddick, Professor of Plant Pathology, Ithaca, N. Y.
 James E. Rice, Professor of Poultry Husbandry, Ithaca, N. Y.
 E. A. White, Professor of Floriculture, Ithaca, N. Y.
 A. E. Wilkinson, Extension Instructor in Vegetable Gardening, Ithaca, N. Y.
 Paul Work, Superintendent and Instructor in Vegetable Gardening, Ithaca,
 N. Y.

LECTURERS FROM NEW YORK AGRICULTURAL EXPERIMENT STATION

- R. D. Anthony, Associate Horticulturist, Geneva, N. Y.
 F. E. Gladwin, Associate Horticulturist, Fredonia, N. Y.
 P. J. Parrott, Entomologist, Geneva, N. Y.
 Geo. A. Smith, Dairy Expert, Geneva, N. Y.
 F. C. Stewart, Botanist, Geneva, N. Y.
 O. M. Taylor, Foreman in Horticulture, Geneva, N. Y.
 L. L. Van Slyke, Chemist, Geneva, N. Y.

LECTURER FROM STATE COLLEGE OF FORESTRY, SYRACUSE

- H. H. Tryon, Department of Forest Utilization, Syracuse, N. Y.

LECTURERS FROM STATE SCHOOLS OF AGRICULTURE

- J. R. Dice, State School of Agriculture, Morrisville.
 F. G. Helyar, Director, State School of Agriculture, Morrisville.
 W. B. Nissley, State School of Agriculture, Farmingdale.
 Van E. Leavitt, State School of Agriculture, Morrisville.
 L. S. Phillips, State School of Agriculture, Morrisville.
 W. C. Sanctuary, State School of Agriculture, Morrisville.

LECTURERS FROM STATE EDUCATION DEPARTMENT

- Dr. E. P. Felt, State Entomologist, Albany, N. Y.
Dr. Thos. E. Finegan, Deputy Commissioner of Education, Albany, N. Y.
Dr. Sherman Williams, Albany, N. Y.

LECTURERS FROM NEW JERSEY AGRICULTURAL EXPERIMENT STATION

- Dr. J. G. Lipman, Director, New Brunswick, N. J.
F. C. Minkler, Professor of Animal Husbandry, New Brunswick, N. J.

SPECIAL LECTURERS

- Dr. Liberty Hyde Bailey, Ithaca, N. Y.
E. W. Catchpole, North Rose, N. Y.
Nathan Cohen, New York City.
J. H. M. Cook, Caldwell, N. J.
H. E. Cox, West Rush, N. Y.
Mrs. Frank C. East, Le Roy, N. Y.
John A. Ennis, Pattersonville, N. Y.
Samuel Fraser, Geneseo, N. Y.
V. E. Fuller, South Orange, N. J.
Jay Gelder, Kanona, N. Y.
H. B. Harpending, Dundee, N. Y.
George W. Harris, Baldwinville, N. Y.
A. T. Henry, Wallingford, Connecticut.
Miss Sara B. Huff, New York City.
Hon. Francis M. Hugo, Albany, N. Y.
G. A. Humphries, New York City.
Prof. I. C. Jagger, Rochester, N. Y.
E. F. McDonald, Massena, N. Y.
Mrs. Rose Morgan, New York City.
Rev. Silas E. Persons, Cazenovia, N. Y.
J. W. Pincus, New York City.
I. F. Rice, Cortland, N. Y.
F. A. Sirrine, Riverhead, L. I.
Dr. E. L. Volgenau, Buffalo, N. Y.
F. S. Welsh, New York City.
H. J. Wilder, Washington, D. C.

FARMERS' DAYS

There were only two places holding farmers' day meetings this year, due to the fact, as intimated in my last report, that these meetings had not had sufficient numerical support. Dates and attendance at these two meetings are shown in the following table:

COUNTY AND PLACE	Correspondent	Date	Sessions	Attendance	Average per session
Orleans, Albion	John Bidleman.	1916 Feb. 23-24-25	8	1,265	158
Washington, Fort Edward	U. G. Ellis	Mar. 21-22-23	8	637	80
Totals . . . . .	.....	.....	16	1,902	119

As usual, Albion was all that could be desired, except a decreased attendance, which was explained by the fact that the sessions of the Supreme Court were extended a week longer than had been expected, which kept many away. In addition, there had been a long series of revival meetings, which naturally militated against the attendance; nevertheless, an average of 158 was very good.

Interest on the part of those present was excellent. So keen was the interest that a special committee has already been appointed to further a like meeting the coming year.

Unfortunately, the meeting in the eastern part of the state, at Fort Edward, Washington County, came at a time when the roads were blocked with snow, and it was impossible for people to come long distances.

The plan in force for the past three years was adhered to, devoting the morning and afternoon sessions of the first day to soils, the like sessions of the second day to crops and stock, and on the third day to horticulture, the evening sessions being given up to themes of general interest. Two special poultry sessions and two sessions for women were held.

Both of these meetings maintained their usual high character, as indicated by the program of the Albion meeting, which is given below:

FARMERS' DAYS
ALBION, ORLEANS COUNTY

February 23, 1916

Lyceum Hall

FERTILITY DAY

A. M.

PRAYER, Rev. W. J. Ford.

ADDRESS OF WELCOME, L. H. Beach, President, Chamber of Commerce.

RESPONSE AND OUTLINE OF WORK, Mr. Van Wagenen.

FERTILIZER PROBLEMS FOR 1916, Dr. Van Slyke.

DISCUSSION.

CONSERVATION OF FARM MANURES, Dr. Lipman.

DISCUSSION.

P. M.

ROUND TABLE.

LIME AND ITS USES, Dr. Lipman

DISCUSSION.

THE STATION ANALYSES OF FERTILIZERS AND SPURIOUS ARTICLES OFFERED.
Dr. Van Slyke.

DISCUSSION.

THE RELATIVE VALUE OF PURCHASED MANURES, COVER CROPS AND FERTILIZERS (Result of extensive field experiments at New Jersey Experiment Station), Dr. Lipman.

DISCUSSION.

SANITATION, Mr. McDonald.

SOCIAL PROBLEMS OF THE FARM COMMUNITY, Mr. Van Wagenen.

February 24, 1916

Lyceum Hall

LIVE STOCK AND FARM CROP DAY

A. M.

THE SWINE INDUSTRY, Mr. Huson.

DISCUSSION.

THE RESULTS OF INTELLIGENT FEEDING OF THE DAIRY COW, Mr. Fuller.

DISCUSSION.

SIMPLE REMEDIES FOR AILMENTS OF FARM ANIMALS, Dr. De Vine.

DISCUSSION.

P. M.

ROUND TABLE.

MUCK LAND CROPS, Prof. Work.

DISCUSSION.

CARE OF MEADOWS, Mr. Fraser.

DISCUSSION.

THE WHEAT CROP, Mr. Van Wagenen.

DISCUSSION.

HISTORY AND LEGENDS OF NEW YORK STATE, Mr. Van Wagenen.

CURRENT EDUCATIONAL PROBLEMS, Mr. McDonald.

REPORT OF FARMERS' INSTITUTES

February 24, 1916

Lower Room, Lyceum Hall

SPECIAL POULTRY SESSIONS

In Charge of Prof. James E. Rice, Ithaca

A. M.

OPENING REMARKS, Prof. Rice.

THE VALUE OF PURE-BRED FOWLS, Mr. Rice.

DISCUSSION.

A DEFINITE PROGRAM FOR BREEDING POULTRY FOR EGG PRODUCTION, Prof. Rice.

DISCUSSION.

P. M.

QUESTION BOX.

FEEDING FOR GROWTH AND EGGS, Mr. Rice.

DISCUSSION.

THE NEW CORNELL POULTRY HOUSE, Prof. Rice.

February 25, 1916

Lyceum Hall

HORTICULTURAL DAY

A. M.

QUESTIONS PERTAINING TO STRAWBERRIES ANSWERED (Printed question slips will be furnished), Mr. Taylor.

THE RESULTS OF SPRAYING FOR THE CODLING MOTH IN MONROE, ORLEANS AND NIAGARA COUNTIES, Dr. Felt.

DISCUSSION.

PROPAGATION AND CARE OF YOUNG TREES, Mr. Fraser.

DISCUSSION.

P. M.

ROUND TABLE.

VARIETIES OF APPLES AND THEIR SOIL ADAPTATION, Mr. Wilder.

DISCUSSION.

INSECTS OTHER THAN THE CODLING MOTH, Prof. Parrott.

DISCUSSION.

CENTRAL PACKING HOUSES, Mr. Welsh.

DISCUSSION.

CLOSING WORDS, Mr. Van Wagenen.

February 25, 1916

Presbyterian Church

SPECIAL WOMEN'S SESSIONS

In Charge of Mrs. Harrington

10 A. M.

OPENING REMARKS, Mrs. Harrington.

NEW WAYS OF DOING OLD DUTIES, Mrs. Harrington.

DISCUSSION.

SEEING THINGS, Mrs. East.

1:30 P. M.

QUESTION BOX.

POINTS IN CHOOSING FURNISHINGS AND TEXTILES, Mrs. Harrington.

DISCUSSION.

THE PURPOSE OF EDUCATION, Mrs. East.

CLOSING WORDS, Mrs. Harrington.

SPECIAL LECTURES

These have been held as heretofore, as indicated by the table following. It will be noted from the subjects listed that they have covered a wide range of topics. Owing to lack of funds, it has been necessary to ask the people where such lectures have been held to pay the traveling expenses and entertainment of the speaker. Undoubtedly this has reduced the number of such lectures. When people are willing to bear a portion of the expense of sending such a lecturer, their real interest and good faith are indicated. Frequently in the past, requests have come for speakers from the Department of Agriculture because, like salvation, they were free, and therefore made a cheap attraction. Not infrequently a man has been sent at an expense of perhaps twenty dollars, where the gathering was not such as would warrant his attending. No matter how abundant funds may be in the future, the policy of asking the local people to bear a portion of the expense of this special work will be adhered to. It is a rule of life that we appreciate most that which costs us something.

RURAL LIFE CONFERENCES

During the past year, on request from several citizens, including many who had previously attended similar meetings conducted by this bureau, two rural life conferences were held — the first, August 25, 1915, at Electric Park, Columbia County; the second, June 2, 1916, at West Coxsackie, Greene County.

Arrangements for these conferences were made with the assured support of the local school principals, clergy, and rural organizations, as well as with the understanding that a portion of the expenses would be met by the respective communities.

The meeting at Electric Park was not so large as it should have been, although the interest was excellent, and as a result a community singing class was organized in one of the nearby villages. The one at West Coxsackie was in point of patronage and interest

the best that was ever held. Owing to the lateness of the corn-planting season, there were not so many farmers present as would have been the case a week later. The program of the latter conference is given below:

PROGRAM

RURAL LIFE CONFERENCE

West Coxsackie, Greene County

June 2, 1916

MORNING

PRAYER.

WORDS OF WELCOME, Rev. W. A. Dumont, West Coxsackie.

RESPONSE AND OUTLINE OF WORK, Edward van Alstyne, Kinderhook.

SINGING—America.

THE HAY CROP, Director van Alstyne.

DISCUSSION.

A HERITAGE OF SONG, Mrs. Rose Morgan, New York City.

RECESS.

AFTERNOON

DEMONSTRATION OF THE POINTS OF A GOOD HORSE, FROM LIVING ANIMALS, Dr. J. F. DeVine, Goshen.

DISEASES OF THE HORSE, Dr. DeVine.

THE CHURCH AND THE OPEN COUNTRY, Rev. Silas E. Persons, Cazenovia.

SINGING.

RURAL LIFE AS IT PERTAINS TO THE HOME AND THE COMMUNITY, Dr. Liberty Hyde Pailey, Ithaca.

SINGING.

EVENING

SONG.

OUR RURAL SCHOOLS, Dr. Arthur Dean, Director of Agricultural and Industrial Education, State Education Department, Albany.

SONG.

SONGS THAT LIVE, Mrs. Morgan.

WORK AMONG JEWISH FARMERS

Following the plan inaugurated in 1913 of doing special work among the Jewish farmers, Mr. F. A. Bonsteel, accompanied by Mr. Nathan Cohen (who acted both as instructor and interpreter), spent nine days in Rensselaer, Sullivan, and Ulster counties, where a goodly number of Jews operate farms. In the past three years this work has demonstrated to these people that the men sent have a message for them, and they are coming to look forward to the meetings. Practically all phases of agriculture must be discussed, yet the subject matter must be condensed and simple. These people are not demonstrative, and it is sometimes difficult to determine how much they are able to carry away and to put into successful practice. The fact that they are in dire need of

agricultural instruction gives them a particular claim on the Bureau of Farmers' Institutes, whose special function it is to disseminate all kinds of agricultural information to all sorts and conditions of men, particularly those not reached by agricultural colleges and experiment stations. A list of these meetings follows:

WORK AMONG JEWISH FARMERS

COUNTY AND PLACE	DATE	SESSIONS	ATTENDANCE	LECTURER	SUBJECT
Rensselaer: Nassau.....	Feb. 10, 1916	1	20	F. E. Bonsteel.. Nathan Cohen..	Fertility, manure, fertilizers, lime. Spraying, interpreting.
Sullivan: Centerville Sta..	Feb. 8, 1916	1	23	F. E. Bonsteel.. Nathan Cohen..	Fertilizers, lime, crop practice. Spraying, interpreting.
Ferndale.....	Feb. 1, 1916	1	45	F. E. Bonsteel.. Nathan Cohen..	Fertilizers, lime, crop rotation, dairying. Forage crops, interpreting.
Glenwild.....	Feb. 8, 1916	1	72	F. E. Bonsteel.. Nathan Cohen..	Fertility, fertilizers, lime, manure, drainage. Spraying, interpreting.
Hurleyville.....	Jan. 31, 1916	1	34	F. E. Bonsteel.. Nathan Cohen..	Fertilizers, lime, forage crops, agricultural law. Spraying, interpreting.
Maplewood.....	Feb. 3, 1916	1	14	F. E. Bonsteel.. Nathan Cohen..	Fertilizers, manure, crop rotation, vetch, potatoes. Spraying, interpreting.
Parksville.....	Feb. 2, 1916	1	34	F. E. Bonsteel.. Nathan Cohen..	Fertilizers, lime, forage crops, dairying. Spraying, interpreting.
Ulster: Briggs Street....	Feb. 5, 1916	1	58	F. E. Bonsteel.. Nathan Cohen..	Soil fertility. Spraying, interpreting.
Ellenville.....	Feb. 7, 1916	1	62	F. E. Bonsteel.. Nathan Cohen..	Fertilizers, lime, manure legumes. Spraying, interpreting.
Kerhonkson.....	Feb. 4, 1916	1	34	F. E. Bonsteel.. Nathan Cohen..	Fertilizers, lime, manure, poultry. Spraying, interpreting.
Total.....	.....	10	396		

The following address was delivered at the Farmers' Institute meeting at Southold, L. I.:

HOW AGRICULTURAL CREDIT WORKS IN NEW YORK STATE

J. W. PINCUS

Secretary, Federation of Jewish Farmers of America

So much has been said within the last few years on the uses and methods of rural credit, and the importance of adopting better methods in this country, that it appears to me that any one who

is at all interested in this subject should have no difficulty in posting himself on it.

Ever since the American Commission went to Europe to study agricultural credit and cooperative organizations abroad, and particularly since its return, this country has been flooded with literature on the subject. Not only has the United States Congress issued bulky volumes containing detailed reports of its commission abroad — not only have numerous bills for the improvement of rural credit been introduced in Congress, as well as in the various state legislatures — but hundreds of articles on this subject have been published in the agricultural and the general press, and within the last year at least three or four books on this subject were issued. Among these special mention should be made of the excellent book on rural credit by ex-Ambassador Herrick and R. Ingalls. Mr. Herrick gave the subject considerable study while he was ambassador in France, and his book should be very useful to any one who is interested in this subject. Anyone desiring to become acquainted with the various bills that have been introduced in the last Congress, would find much of interest in the book, *Land Credits*, by D. T. Morgan, United State Representative from Oklahoma.

I must admit that a farmer — or, so far as that is concerned, any layman that has very limited time for reading at his disposal — will find himself somewhat bewildered by the abundance of literature and diversity of opinion on this subject. I shall not attempt to present to you a theoretical discussion of rural credit, or the advantages or disadvantages of the various systems, but will endeavor in a few words to give you the actual workings of credit institutions, which are unique and which are actually in operation among Jewish farmers in this country.

To begin with, we must remember that there are two distinct forms of credit — the so-called “short-term credit,” and the “long-term credit.”

SHORT-TERM CREDIT

The short-term credit institutions, or the so-called cooperative credit unions, have been started in this country by the Jewish farmers. The following extract is taken from *Rural Credit*, by ex-Ambassador Herrick:

"The first, and so far the only, organized effort to establish cooperative credit among farmers in the United States is that which is being made by the Jewish Agricultural and Industrial Aid Society, a benevolent association chartered in 1900 under the laws of the state of New York to take over the agricultural branch of the work of the Baron de Hirsch Fund, another benevolent association chartered in 1891 in the same state to administer the \$2,400,000 donated by Baron Maurice de Hirsch, on the condition that its income should be applied to assisting Jewish immigrants driven from their homes by political or religious persecutions."

"The Jewish Agricultural and Industrial Aid Society obtains the money for its operations and expenses from the Baron de Hirsch Fund and the Jewish Colonization Association, the Baron's residuary legatee. In 1907 the Society eliminated from its consideration the industrial activities of immigrants so as to be free to develop entirely along agricultural lines, and it then so enlarged its scope in the latter respect as to become the head of the propaganda and organization work for Jewish farmers, immigrant and native, throughout the United States. This change of policy and program was brought about by Leonard G. Robinson, who in that year was appointed the general manager of the Society."

At the present time there are 19 of these cooperative credit unions in operation; 8 of them in New York State, 5 in Connecticut, 5 in New Jersey, and 1 in Massachusetts. Originally they were all started as voluntary unincorporated associations; but, as New York and Massachusetts have special laws for incorporating credit unions, the credit unions of these states have already been, or are about to be, incorporated. These cooperative credit unions are strictly cooperative, and the voting power is vested in the members and not in the shares. While the shares are sold at \$5 each, they are also sold on easy payments, and are therefore within the reach of everyone. The basis of credit is character and industry, although, of course, promissory notes with indorsements or other necessary forms of security are required.

All these credit unions operate in small communities and among small groups. Our largest credit union has a membership of 46; the smallest, 14. Most of these organizations have started with a capital of \$500 and the Jewish Agricultural and Industrial Aid Society loaned to them from \$500 to \$1,000 at 2 per cent interest. The money is loaned to members only, at 6 per cent interest, and usually in sums not to exceed \$100 and with frequent partial repayments. Three of the credit unions were organized in 1911; five, in 1912; nine, in 1913; one, in 1914; and one, in 1915.

Since their organization, these credit unions, with a membership of a little over 500 and a capital of a little less than \$10,000, have granted loans amounting to over \$210,000. The interest and all

other profits are accumulated in the reserve fund, which at the present time, after paying the expenses of the various local associations, amounts to \$3,240.76. The expenses of these associations are very small, as usually the only official getting any compensation — and this is a nominal one — is the secretary; there is in addition a slight expense for stationery and postage.

The credit unions are authorized to declare an annual dividend upon the share capital, but a provision is made that 25 per cent of the profit should remain as a reserve fund, until the reserve fund should equal the total paid-in capital.

Our cooperative credit unions are located in rural communities and, practically speaking, all members are farmers and nearly all of them are borrowers. If some credit unions could be formed in small industrial centers, the cooperative credit unions could be used for encouraging saving and thrift among the members; at the same time, this would increase the working capital of the credit unions and enable the farmers, or other members who may need the money for productive purposes, to borrow this money.

The success of these credit unions in all European countries, particularly in Germany, is due to the fact that they are federated into unions. This enables them to see that the money is more evenly distributed in those centers where it is needed. According to the last statistics of the International Cooperative Alliance, the Imperial Union of German Agricultural Societies — which includes all cooperative credit unions — was, in 1909, as follows:

Total number of societies affiliated.....	12,614
Members	1,163,186
Turn-over of money	\$1,114,040,355
Total assets	\$485,634,905
Reserve fund	\$1,274,765

There is also a union of credit societies called "Wurtemberg Societies," having 1,141 societies; another at Baden, with 416 societies; and another, called the "Rhenish Prussian Auditing Credit Union," with 345 societies. Besides the above, there are also 1,598 societies belonging to the Urban Industrial Credit Unions.

As soon as the cooperative credit unions are more developed and understood in this country, and once they are federated into state leagues and then into national or federal leagues, I am sure that they could be made as useful and popular in this country as they are in Germany and other European countries.

AGRICULTURAL CREDIT

We shall now consider the other form of rural credit—the so-called long-term or agricultural credit.

When the New York State Legislature passed the Land Bank Law in 1914, the first group of farmers to take advantage of it were the Jewish farmers residing in Sullivan and Ulster counties, who, with the help of their national organization, the Federation of Jewish Farmers of America, organized the First Farmers' Savings and Loan Association. This association is recognized as the first and only farmers' organization by the Superintendent of Banks of the State of New York, Hon. E. L. Richards. As I said before, I shall not give you the theory of the need of agricultural credit, but will try to tell you how we went about organizing it, and of what benefit it has been to us.

A large number of Jews have settled in Sullivan and Ulster counties within the last eleven to twelve years, and a number of them have built on their farms large boarding houses or hotels in which they accommodate summer boarders. As many of the Jews who settled there came with a rather small capital, and as the building of these boarding houses or hotels, together with other necessary buildings, required a large amount of capital, the farmers were obliged to go to private individuals; these individuals took advantage of the need of capital, with the result that bonuses of from 20 to 35 per cent were not unusual. In addition to these heavy bonuses, most of these loans were made for a short period, of five to seven years. As time went on the periods became shorter, so that many of these mortgages are now made for three to four years.

The result was that the farmers, in addition to paying heavy bonuses, were also obliged every year to pay heavy legal expenses; besides, they were constantly worrying about losing their property

by not being able to meet the payments. Recognizing what a great help a financial institution to remedy the situation would be to these people, a preliminary meeting was held at Centerville Station, June 4, 1914, at which, with the help of several officials interested in the Land Bank, the First Farmers' Savings and Loan Association was organized.

Any savings and loan association incorporated under the laws of New York State can become a member of the Land Bank of the State of New York on payment of a share of \$1,000; therefore, the First Farmers' Savings and Loan Association at once became a member. About one month ago we received our first installment of \$5,000 from the sale of the debenture bonds issued by the Land Bank. In order to secure these loans, we were obliged to place with the Land Bank mortgages amounting to a little over \$6,000. All these mortgages are deposited for safe keeping with the State Comptroller's office in Albany. We just received a notice from the Land Bank to file an additional application for money. According to law we are entitled to \$15,000 more, provided, of course, we will give them the necessary mortgages.

On account of the present financial condition, it was not deemed advisable for the Land Bank directors to issue these bonds for longer than ten years. They have sold them for $4\frac{1}{2}$ per cent, charging us $\frac{1}{2}$ per cent additional for expenses, so that our association gets them for 5 per cent; we lend out this money, as well as our own, at 6 per cent interest. While this may appear rather a high rate of interest, you must remember that all the profits belong to the shareholders of the association, and that we expect in the near future to get money on more advantageous terms from the Land Bank, when we shall be able in turn to reduce our rates of interest to the farmers.

Our savings and loan association recently held its second annual meeting in Centerville Station, and I can give you the following interesting data from the annual report:

We made altogether five loans on farms as follows: \$800, \$1,700, \$3,200, \$3,500, and \$3,000, making a total of \$12,200. The law permits us to grant loans up to 60 or 70 per cent, but we have

in all cases granted less than 50 per cent, as the following table will show:

Amount of Loan	Acres	Value of Farm	Percentage of Mortgage
\$800	100	\$7000	11
1700	62	4950	35
3200	108	8900	36
3500	48	6700	41
3000	170	8500	35

From the above table you will see that we were very careful and conservative in making our loans. It may interest you to know that on the few loans mentioned above we have saved two farmers from losing their farms entirely, one of which has paid in the last ten years nearly \$2,000 in bonuses. One of the men, to whom we gave a loan of \$3,200, was offered a loan for five years, but he would have to pay bonuses of \$800. On a loan of \$1,700 we saved a man a bonus of \$150, and on a small loan of \$800 we saved a bonus of \$80. We now have on hand applications from farmers for loans amounting to nearly \$80,000; and, had we sufficient funds, we should have no difficulty in placing ten times that amount on first mortgages in the territory in which we are operating.

It is a very easy matter for any group of farmers to organize a savings and loan association and become a member of the Land Bank and thus be able to serve their community. The savings and loan associations of this state are under the supervision of the Banking Department. They have been in existence for a large number of years and are conducted in a conservative and economic way. None of them pay large salaries to officers; in fact, their expenses are circumscribed by the statutes.

I cannot understand why a large number of farmers in this state have not taken advantage of them. It is true that the savings and loan associations, as originally planned, are better adapted for city employees, who receive a regular monthly or weekly wage, and who are thus afforded an opportunity for saving money and acquiring homes on easy payments; but there is absolutely no reason why farmers of every state—particularly farmers residing within comparatively short distances from New York City—cannot organize savings and loan associations in their midst.

The local banks, the business man, the retired capitalists that live in your village, the commuters that work in the nearby cities, your son and daughter, and you yourself — be you gardener, dairyman, or fruit grower — could use this savings and loan association for putting away a certain definite amount every week or month, for investing your savings in larger sums in shares of the savings and loan association, or in any other way prescribed by law the savings and loan association could be used as an institution for savings and thrift. As soon as your capital reaches \$10,000 or over, you can buy a share in the Land Bank for \$1,000, send your mortgages to the Land Bank and get 80 per cent of their value, and reinvest that money in other mortgages. This will certainly help to develop your community, attract more people to your village, and in general help the prosperity of your farmers, as well as all residents of your district.

Just now our Sixty-Fourth Congress is in session, and I understand 118 bills have already been introduced for the improvement of rural credit.* Undoubtedly some rural credit legislation will be passed at this session, and it may afford a better opportunity for the improvement of rural credit; but in the meantime every farming community, particularly in New York State, should get busy and take advantage of the excellent Land Bank already in existence.

I hope that the local, state, and national granges, as well as other national farmers' organizations, our State Department of Agriculture, all our extension departments, and the agricultural colleges, will bring the problem of rural credit to the farmers. The problem of production of crops has been discussed for years by these institutions, and the time has come when the proper financing, which includes also marketing, should be developed. Every one interested in the promotion of agriculture in this country should make every possible effort to familiarize every farmer with this subject.

* The bill known as "The Federal Farm Loan Act" was approved July 17, 1916.

MISCELLANEOUS MEETING TO WHICH DEPARTMENT LECTURERS WERE SENT

COUNTY AND PLACE	DATE	SESSIONS	ATTENDANCE	LECTURER	SUBJECT
ALBANY:					
Albany	Oct. 21, 1915	1	20	Edward van Alstyne	Making a man
Albany	Jan. 20, 1916	1	100	Edward van Alstyne	Improving our fairs
Berne	May 2, 1916	1	14	H. E. Crouch	Demonstration — treating seed oats, seed potatoes; spraying and pruning
Bethlehem Center	April 5, 1916	1	8	Wm. Hotaling	Orchard demonstration
Chesterville	May 3, 1916	1	8	William Hotaling	Demonstration — treating seed oats and seed potatoes; spraying and pruning
Coeymans	April 7, 1916	1	12	William Hotaling	Orchard demonstration
Dormansville	Aug. 14, 1915	1	150	Jared Van Wagenen, jr.	Dairying
Dormansville	June 24, 1915	1	150	Jared Van Wagenen, jr.	General agriculture
Dormansville	April 12, 1916	1	26	William Hotaling	Orchard demonstration
Dunnsville	April 13, 1916	1	16	William Hotaling	Orchard demonstration
Guilderland	April 6, 1916	1	8	William Hotaling	Orchard demonstration
Guilderland Center	May 1, 1916	1	8	H. E. Crouch	Demonstration — treating seed oats and seed potatoes; spraying and pruning
Indian Fields	April 12, 1916	1	14	William Hotaling	Orchard demonstration
Knox	May 1, 1916	1	12	H. E. Crouch	Demonstration — treating seed oats and seed potatoes; spraying and pruning
Lambs Corners	Nov. 20, 1915	1	42	William Hotaling	Farm bureaus
Latham's Corners	April 6, 1916	1	8	William Hotaling	Orchard demonstration
New Salem	May 2, 1916	1	8	H. E. Crouch	Demonstration — treating seed oats and seed potatoes; spraying and pruning
Preston Hollow	May 4, 1916	1	18	William Hotaling	Demonstration — treating seed oats and seed potatoes; spraying and pruning
Ravena	April 7, 1916	1	8	William Hotaling	Orchard demonstration

MISCELLANEOUS MEETING TO WHICH DEPARTMENT LECTURERS WERE SENT — *Continued*

COUNTY AND PLACE	DATE	SESSIONS	ATTENDANCE	LECTURER	SUBJECT
ALBANY — <i>Continued</i>					
Rensselaerville.....	May 3, 1916	1	8	H. E. Crouch.....	Demonstration — treating seed oats and seed potatoes; spraying and pruning Orchard demonstration
South Bethlehem.....	April 5, 1916	1	25	William Hotaling.....	Orchard demonstration
South Westerlo.....	May 4, 1916	1	30	H. E. Crouch.....	Demonstration — treating seed oats and seed potatoes; spraying and pruning Orchard demonstration
Verdoy.....	April 10, 1916	1	15	William Hotaling.....	Orchard demonstration
BROOME:					
Binghamton.....	Feb. 24-26, 1916	3	205	Miss Jennie C. Jones.....	Home topics, cooking demonstration
Windsor.....	Sept. 4, 1915	1	300	Forest Henry..... A. J. Nicoll.....	Fertility, dairying, horses Dairying, cow testing
CHAUTAUQUA:					
Sherman.....	Feb. 2, 1916	2	117	Dr. William H. Dexter.....	Dairying, community spirit
CHENANGO:					
Afton.....	May 5, 1916	1	15	H. H. Tryon.....	Forestry
CLINTON:					
Chazy.....	Aug. 4, 1915	1	350	Jared Van Wagenen, jr.....	General agriculture
Plattsburg.....	Jan. 14, 1916	1	132	Edward van Alstyne.....	Rural citizenship
COLUMBIA:					
Claverack.....	June 6, 1916	2	51	Mrs. Orra P. Phelps.....	Home topics, cooking demonstration
Clermont.....	Aug. 28, 1915	1	250	B. D. Van Buren.....	Apple-packing law
Copake.....	June 5, 1916	1	32	Mrs. Orra P. Phelps.....	Home topics, cooking demonstration

*Electric Park.....	Aug.	25, 1915	2	150	Edward van Alstyne. Prof. E. G. Montgomery Prof. W. H. Chandler V. E. Fuller Dr. S. Williams Miss Sara B. Huff Edward van Alstyne. Mrs. I. S. Harrington Mrs. Orra P. Phelps.	General agriculture Hay crop Fruit Dairy feeding Rural schools Community singing Farm bureaus Home topics Home topics, cooking demonstration
Hilldale.....	Sept.	18, 1915	2	225		
Hudson.....	Nov.	8-10, 1915	4	295		
New Lebanon.....	June	3, 1916	1	17		
CORTLAND: Cortland.....	Aug.	10, 1915	1	200	Edward van Alstyne.	Rural citizenship
DELAWARE: Halcott Center.....	April	15, 1916	1	55	A. J. Nicoll	Cow testing
North Kortright.....	Dec.	8, 1915	1	40	F. E. Bonsteel	Dairying
DUTCHESS: Lake Hammersley.....	June	15, 1916	1	100	Prof. F. C. Minkler	Swine
Millbrook.....	Dec.	2, 1915	1	15	Edward van Alstyne.	Dairying, cow testing
ESSEX: Wadhams.....	Dec.	8, 1915	2	145	Jared Van Wagenen, jr.	Agricultural law
GENESEE: Batavia.....	June	27-28, 1916	4	232	Miss M. Bowers	Home topics, cooking demonstration
GREENE: East Durham.....	May	5, 1916	1	12	H. E. Crouch William Hotelling	Demonstration — treating seed oats and seed potatoes; spraying and pruning
Greenville.....	Mar.	6, 1916	2	160	Edward van Alstyne.	The farmer and the church, rural church
Greenville Center.....	May	6, 1916	1	30	H. E. Crouch William Hotelling	Demonstration — treating seed oats and seed potatoes; spraying and pruning
Kiskatom.....	Nov.	6, 1915	1	150	A. J. Nicoll	Rural citizenship

*Rural life conference

MISCELLANEOUS MEETING TO WHICH DEPARTMENT LECTURERS WERE SENT — *Continued*

COUNTY AND PLACE	DATE	SESSIONS	ATTENDANCE	LECTURER	SUBJECT
GREENE — <i>Continued</i>					
New Baltimore	May 6, 1916	1	33	H. E. Crouch	Demonstration — treating seed oats and seed potatoes; spraying and pruning
Oak Hill	May 5, 1916	1	25	William Hotelling	Demonstration — treating seed oats and seed potatoes; spraying and pruning
Stanton Hill	Aug. 14, 1915	1	437	H. E. Crouch	Rural citizenship
West Cocksackie	Sept. 29, 1915	1	150	G. A. Humphries	Making a man
*West Cocksackie	June 2, 1916	3	525	Edward van Alstyne	Hay crop
				Dr. L. H. Bailey	Rural life
				Dr. J. F. De Vine	Horses — demonstration
				Rev. S. E. Persons	Church and open country
				Dr. Thomas E. Finegan	Rural schools
				Mrs. Rose Morgan	Music
JEFFERSON:					
Cape Vincent	Jan. 31, 1916	2	60	Mrs. Orra P. Phelps	Home topics
Champion	Feb. 2, 1916	2	120	Mrs. Orra P. Phelps	Home topics
Lorraine	Feb. 3, 1916	2	140	Mrs. Orra P. Phelps	Home topics
Perch River	Feb. 4, 1916	1	34	Mrs. Orra P. Phelps	Home topics
Redwood	Feb. 1, 1916	2	95	Mrs. Orra P. Phelps	Home topics
Watertown	Nov. 8, 1915	1	175	Jared Van Wagenen, jr.	Control of bovine tuberculosis
LEWIS:					
Copenhagen	June 14, 1916	2	36	Mrs. Orra P. Phelps	Home topics, cooking demonstration
LIVINGSTON:					
Dansville	Nov. 16-18, 1915	6	1,364	Mrs. I. S. Harrington	Home topics, cooking demonstration
				Mrs. Orra P. Phelps	Home topics
				Miss Sara B. Huff	Music

Lima.....	Jan.	21, 1916	1	60	H. B. Harpending.....	Swine
Lima.....	Feb.	4, 1916	1	40	Prof. E. O. Pippin.....	Drainage
Lima.....	Feb.	18, 1916	1	30	O. M. Taylor.....	Horticulture
Lima.....	Mar.	7, 1916	1	25	H. E. Cox.....	Bean raising
MONTGOMERY:						
Fonda.....	Jan.	28, 1916	1	132	Edward van Alstyne.....	Dairying
NEW YORK:						
Columbia University.....	Dec.	3, 1915	1	135	Edward van Alstyne.....	City man's opportunities in farming
Columbia University.....	Dec.	17, 1915	1	45	A. T. Henry.....	Peaches
Columbia University.....	Jan.	21, 1916	1	82	W. E. Nissley.....	Greenhouse gardening
Columbia University.....	Jan.	28, 1916	1	100	Prof. E. A. White.....	Flowers
Columbia University.....	Feb.	4, 1916	1	85	J. H. M. Cook.....	Beekeeping
Columbia University.....	Feb.	25, 1916	1	70	Paul Work.....	Vegetable gardening
Columbia University.....	Mar.	3, 1916	1	60	Edward van Alstyne.....	Apple orcharding
Columbia University.....	Mar.	10, 1916	1	50	F. S. Welsh.....	Central apple-packing house
Columbia University.....	Mar.	17, 1916	1	50	George L. Flanders.....	Agricultural law
Columbia University.....	Mar.	24, 1916	1	62	A. J. Nicoll.....	Farm management
Columbia University.....	Mar.	31, 1916	1	60	Jared Van Wagenen, jr.....	Agricultural education
Columbia University.....	April	7, 1916	1	50	C. R. White.....	Marketing
Columbia University.....	April	14, 1916	1	60	Dr. B. T. Galloway.....	Outlook for farmers in the east
ONEIDA:						
Floyd.....	May	31, 1916	1	17	Mrs. Orra P. Phelps.....	Home topics
Utica.....	Feb.	4, 1916	1	45	D. P. Wittier.....	Fertilizers
Utica.....	Feb.	29, 1916	2	65	Edward van Alstyne.....	Dairying
Utica.....	April	14, 1916	1	28	Edward van Alstyne.....	Rural citizenship
ONONDAGA:						
Syracuse.....	Sept.	14, 1915	1	110	Jared Van Wagenen, jr.....	General agriculture
Syracuse.....	Jan.	29, 1916	1	17	Edward van Alstyne.....	Sheep
ONTARIO:						
Ionia.....	July	10, 1915	1	300	Jared Van Wagenen, jr.....	The good farmer

*Rural life conference.

MISCELLANEOUS MEETING TO WHICH DEPARTMENT LECTURERS WERE SENT—Continued

COUNTY AND PLACE	DATE	SESSIONS	ATTENDANCE	LECTURER	SUBJECT
OSWEGO:					
Lacona.....	June 13, 1916	2	69	Mrs. Orra P. Phelps.....	Home topics
OTSEGO:					
Gilbertsville.....	April 8, 1916	1	14	A. J. Nicoll.....	Dairying
Gilbertsville.....	April 9, 1916	1	40	A. J. Nicoll.....	The rural home
Hartwick.....	Jan. 15, 1916	2	80	Edward van Alstyne.....	Sheep
Worcester.....	Aug. 27, 1915	4	898	William Hotelling.....	Judging fruit, flowers, vegetables
RENSELAER:					
Nassau.....	Feb. 10, 1916	1	21	F. E. Bonsteel..... Nathan Cohen.....	Fertility, manure, fertilizers, lime Spraying, interpreting
St. LAWRENCE:					
Brier Hill.....	June 12, 1916	2	43	Mrs. Orra P. Phelps.....	Home topics
SARATOGA:					
Charlton.....	Sept. 2, 1915	2	425	Mrs. D. A. Jones.....	Home topics
Charlton.....	Feb. 8, 1916	1	85	Jared Van Wagenen, jr.....	Farm management
SCHENECTADY:					
Hardin's Crossing.....	April 12, 1916	1	35	Jared Van Wagenen, jr.....	General agriculture
Schenectady.....	June 17, 1916	1	50	Miss Jennie C. Jones.....	Home topics, agricultural community fair
SCHOHARIE:					
Breakabeen.....	Aug. 17, 1915	1	100	Jared Van Wagenen, jr.....	General agriculture
Jefferson.....	Aug. 20, 1915	1	200	Jared Van Wagenen, jr.....	General agriculture
Jefferson.....	Aug. 27, 1915	1	2,000	A. J. Nicoll.....	Farming as a business

MISCELLANEOUS MEETING TO WHICH DEPARTMENT LECTURERS WERE SENT — *Concluded*

COUNTY AND PLACE	DATE	SESSIONS	ATTENDANCE	LECTURER	SUBJECT
WYOMING:					
Warsaw.....	Jan. 7, 1916	1	100	Edward van Alstyne.....	Dairying
YATES:					
Bellona.....	Sept. 1, 1915	1	200	Edward van Alstyne.....	Making a man
	Total.....	158	14,067		

COOPERATIVE WORK WITH COLUMBIA UNIVERSITY

This was undertaken in 1914 as an experiment, but is now so well established that the last legislative budget contains an item of \$500 for such work.

On account of the abundance of war news, it was impossible to obtain the newspaper notices of this work that had been given in previous years. Nevertheless, the attendance was good, and the interest was never better. This is doubtless due to two reasons — the practical, conservative nature of the work, and the additional fact that Professor O. S. Morgan, dean of the Agricultural School, has established a place for himself among the agricultural teachers of the state. Located as he is in the great metropolis, his conservatism and honesty, as well as his practicability, are becoming widely appreciated at a time when the public is suffering from a horde of would-be agricultural leaders, conspicuous because of their vagaries and wonder-tales as well as their impractical ideas.

It had been our intention to publish the entire list of lectures in this report, but it has been impossible to secure all the manuscript. Professor Morgan's statement as to the work is given below, followed by several of the lectures given at the University during the past year.

INSTITUTE FOR CITY-DWELLING FARMERS

O. S. MORGAN

Dean, Agricultural School, Columbia University, New York City

The work of the third year of the institute has been satisfactorily closed. The cooperation of the State Department of Agriculture has been appreciated by many persons coming to the Institute, as well as by Columbia University.

The object of the work is to give as nearly as possible practical advice on matters agricultural to all people of New York City who are interested in farming and agriculture and who desire such help from us. The institute has no axe, large or small, to grind — unless the desire on the part of its sponsors to be of constructive service to a number of citizens may be so considered. It is not

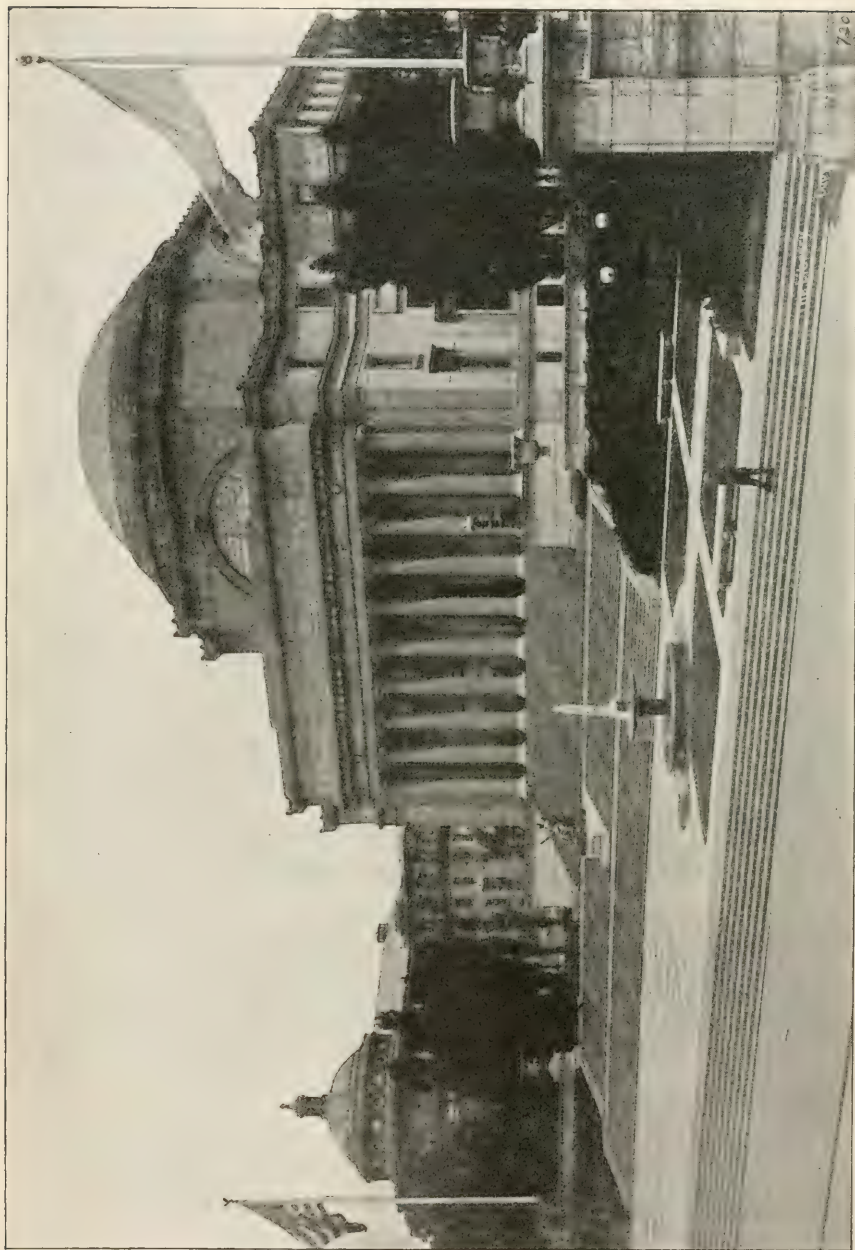


FIG. 550.—COLUMBIA UNIVERSITY — THE LIBRARY

the agitator of a "forward" or "back-to-the-farm" movement. In being the expositor of practical farming, its distinct tendency is to dampen the enthusiasm for farming that too often characterizes the city man with a hobby for farming. It has a wholesome tendency to prevent suicidal plunging into farming by the "tired-of-city-life" man or woman, through its frequent reference to the scientific knowledge and experience requisite to the successful management of a farm of reasonable acreage, diversification, and capital.

We have distributed about 2,000 farm subject bulletins during the year. These have been willingly contributed by the New York State Department of Agriculture, the New York State College of Agriculture, the New York Experiment Station, the U. S. Department of Agriculture, etc.

We have set apart a small, but convenient, conference room for the institute. Last year there seemed to be some call for such a place. Experience this year indicates that generally there is little need for such accommodations, as most inquirers are better satisfied with the brief replies to their questions made at the close of the lectures and with the correspondence resulting from the plan outlined in the next paragraph.

Through a simple blank calling for address and subject of inquiry, it has been possible to help many persons attending the institute in a very definite way. The work of answering the 400 to 500 inquiries resulting from the blank has fallen on the cooperating office at Columbia University. This phase of the work seems to do more than supplant the conference room with its demand for attention one day a week during the course of the institute.

The approximate attendance for each lecture and the total is given below:

DATE		SUBJECT AND SPEAKER	ATTENDANCE
1915			
Dec.	3	"Abandoned Farms and the City Man's Opportunities in Farming"—E. van Alstyne, Director of Farmers' Institutes, Albany, N. Y.	135
Dec.	10	"Building Up the Dairy Herd Through Breeding"—Dr. O. C. Bowes, Columbia University.	65
Dec.	17	"Peach Growing in the East"—A. T. Henry, Wallingford, Conn.	45

DATE 1916	SUBJECT AND SPEAKER	ATTENDANCE
Jan. 7	"Profitable Feeding Practices for the Dairy Herd"— Dr. O. C. Bowes, Columbia University.....	45
Jan. 14	"Clean Milk; Its Production and Importance to Pro- ducer and Consumer"—Prof. C. W. Larson, Colum- bia University	107
Jan. 21	"Greenhouse Gardening"—W. B. Nissley, School of Agriculture, Farmingdale, L. I.	82
Jan. 28	"Amateur and Commercial Flower Production"—Prof. E. A. White, Cornell University.....	100
Feb. 4	"Beekeeping in the East"—J. H. M. Cook, Caldwell, N. J.	85
Feb. 11	"Beef and Veal Production in the East"—Dr. O. C. Bowes, Columbia University.....	50
Feb. 18	"Farm Manures vs. Commercial Fertilizers"—Dr. T. H. Eaton, Columbia University.....	60
Feb. 25	"Vegetable Gardening"—Paul Work, Cornell Uni- versity	70
March 3	"Importance and Outlook of Apple Orcharding in the East"—Edward van Alstyne, Director of Farmers' Institutes, Albany, N. Y.	60
March 10	"The Central Packing House and the Importance of Grading and Packing Apples"—F. S. Welsh, Agri- culturist, N. Y. C. R. R.	50
March 17	"Agricultural Law as Affecting Producer and Consumer in New York"—George L. Flanders, State Depart- ment of Agriculture, Albany, N. Y.	50
March 24	"Farm Accounts and Farm Management"—A. J. Nicoll, State Department of Agriculture, Albany, N. Y.	62
March 31	"Agricultural Education; the Interrelation of Theory and Practice"—Jared Van Wagenen, jr., State Department of Agriculture, Albany, N. Y.	60
April 7	"Marketing; the Paramount Problem in Farming"— C. R. White, State Department of Agriculture, Albany, N. Y.	50
April 14	"The Outlook for Farmers in the East"—Dr. B. T. Galloway, Dean, N. Y. State College of Agricul- ture, Cornell University.....	60
Total attendance		1236

This does not signify that there were 1,236 different persons in attendance. From the partial list made up from address slips handed in, it is concluded that from six to eight hundred different persons came to the lectures during the course.

The subjects that most often raise questions are such as tie up with farm management, marketing, fruit growing, poultry, and hog production. The coming year, therefore, should look to the provision of lectures and conferences by experts along these lines.

ABANDONED FARMS AND THE CITY MAN'S OPPORTUNITIES IN FARMING

EDWARD VAN ALSTYNE

New York State Director of Farmers' Institutes

My subject, as the title indicates, is a dual one, with just enough interrelation to justify presenting it as one. First, I give you the underlying facts, and, if you will accept them, we shall be in a position to draw conclusions, which I hope may be helpful.

So antagonistic are the pictures held up depicting our New York farm conditions that it is no wonder, when the western man thinks of them, that too frequently he thinks of a land of abandoned, worn-out farms, a fit habitation only for serpents, where agriculture is on the decline, overwhelmed by manufacture and commerce. Another picture, with a somewhat different background, conveys the idea that great areas of farm land, well-watered and fertile, are crying for a purchaser, at prices less than the cost of the buildings; while the land is only waiting for a touch of the magic wand of an occupant — no matter how slight his knowledge may be of matters of earth earthly — which will cause it to bud and blossom like Aaron's rod, and yield "seed to the sower and bread to the eater."

Both extremes are erroneous. Underneath them lies a grain of truth, most misleading and therefore harmful, both to the individual and to the state. A partial truth is always more dangerous than an outright lie. The latter is bound to die of its own weight; the former, with the earmarks of truth, lives and continues to exert an evil influence. In this case the truth is found between the two extremes.

LAND AREAS

A few figures from the last federal census are worthy of consideration. There were in 1900, 226,720 farms in the state; in 1910, 215,597 — a decrease of 11,123. This may be accounted for by a few farms being abandoned, or, more often, attached to other farms. Some have been absorbed by commercial concerns; others taken into municipalities for building purposes, parks, or for public utilities; and others by eleemosynary or penal institutions, several farms being taken together in one large tract. Such

is the case at Yorktown, Westchester County, where what in 1900 was four farms now comprises the four-hundred-acre tract where eventually the boys from Blackwell's Island are to be located. In not a few instances wealthy men have combined a number of farms into a great estate. This latter is to be deplored, for such agriculture has usually been unprofitable from an economic standpoint, however alluring the scheme may appear on paper — even more deplorable from the fact that citizenship is destroyed. Where there were a dozen or more farm owners — citizens more or less vitally interested in all that concerns the best interests of the community — their places have been taken by transients, or hirelings, who have little thought other than to eat and drink and draw their stipend.

The total land area of the state consists of 30,498,560 acres. In 1900 there were in farms, 22,648,109 acres; in 1910, 22,030,367 acres — a decrease of 617,742 acres. The above figures prove the truth of the reasons given for the decrease in farms. In 1900, the size of the average farm was slightly less than 100 acres; in 1910, somewhat over 102 acres. If we divide the decrease in acres by the decrease in farms, the average would be $55\frac{1}{2}$ acres as the size of the absorbed farms.

More important is the number of acres reckoned as improved farm land. In 1900 it was 15,599,986 acres; in 1910, 14,844,039 acres — a decrease of 755,947. This decrease is accounted for by the fact that many of the lands listed as improved in 1900 are no longer being used for farm purposes. I am very sure a fuller knowledge of the facts would show that, in the economic evolution during the last decade in agricultural conditions, not a few acres considered worth counting as improved land at the beginning of the century were not so considered ten years later. Probably in some cases this was because of bad farming — for it is bad farming in the last analysis so to handle land as to decrease its productive value — and in more cases because men have seen the wisdom of putting their efforts on their best lands, which are more economically tilled nearer centers of population, letting the less desirable literally go to grass or to woodlands, of which more anon.

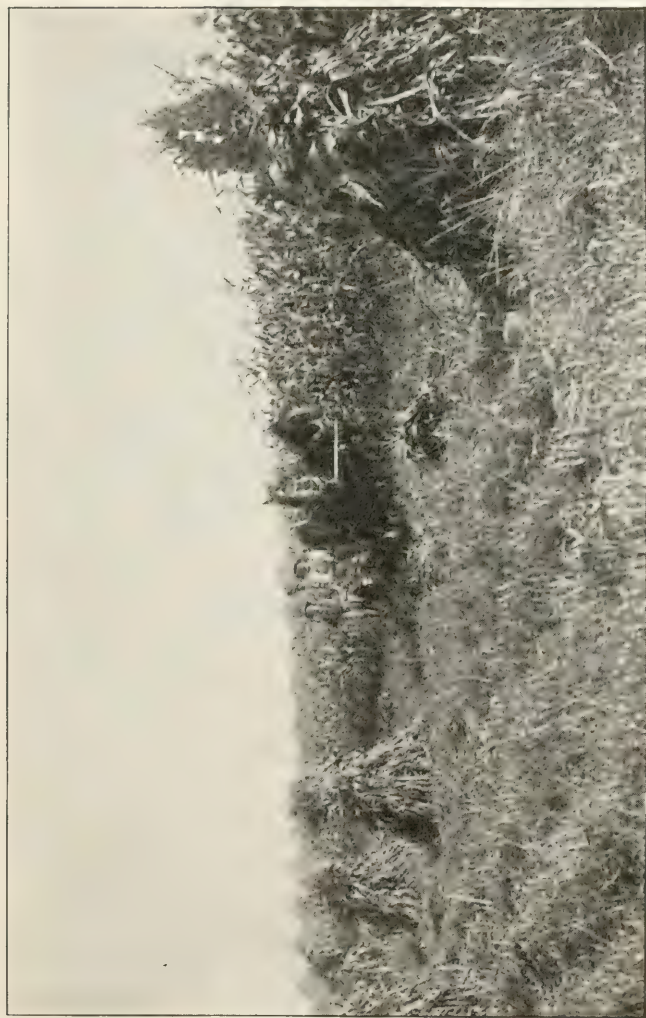


FIG. 551.—CORN CROP ON GOOD LAND IN NEW YORK STATE

Here are some figures which to my mind are very significant: As shown by the last census there were 15,824,840 acres operated by owners; by managers, 838,476 acres — nearly nineteen times as many owners as managers. In 1900, there were 6,119,706 acres occupied by tenants; in 1910, 5,367,051 acres — a decrease in acres of 752,655. Why are these figures significant? Because they show that more than four-fifths of New York acres are farmed by owners rather than managers, and that in the last ten years three quarters of a million acres less are farmed by tenants than in the previous decade. With all respect to the many excellent managers and the large number of good tenant farmers, the fact is patent that a system of second-hand, absent-ownership farming means a decline in production and consequently in land values, and, as a further consequence, in citizenship — more deplorable than either. There can be no really successful agriculture without permanency on the land. The tenant system of Great Britain, which some of you may cite to refute my statement, proves it, for that system is based on leases descending from father to son — from generation to generation — and it recognizes permanent improvement. Where the reverse is true, agricultural conditions are most deplorable.

A few years ago I sent out a questionnaire over the state, asking among other things as to the number of rented farms. I found that with one exception the counties with the largest proportion of tenants were the least prosperous. The longer the system had been in vogue, the smaller the production and the lower the standard of citizenship. The system as usually followed results in skinning the land, the transient population having no interest beyond the present, and those long-time investments which mean so much are never made. Ditches are stopped; weeds and briers come by the fence corners and gradually encroach into the field; fences and buildings are not repaired; no thought exists as to maintaining the productivity of the land. Then the tenant moves on to repeat the process on the land of some good farmer who has moved to town, and, for lack of occupation and because he has carried his individualism with him, has become a most “undesirable citizen.” Such men, either owners or tenants, commit a greater crime against the community than he who commits arson

or robbery. The latter affect only a few individuals and can be repaired with only a temporary loss. He who burns up the vegetable matter and robs the soil commits a crime against the commonwealth which a generation will not repair.

The exceptional county is that in the Genesee Valley, where large areas of land are owned by my friends, the Wadsworths, who have a system of tenantry not unlike that in England, which is based on building up the land. Most admirably does it succeed, but, alas! it does not make for citizenship. After a man has inhaled the air of America, if he has any vision, he wants to become a landowner, an integral part of the great commonwealth — a most laudable ambition. Here where the land is owned by the few he cannot expect to become an owner, hence as he prospers he must turn his steps to some other region; therefore, his roots never sink very deep into the soil, and he does not become the factor in the community life that he should, for his eyes are always fixed beyond the bounds of his line fences.

This decrease in managers and tenants indicates that the state of things outlined is becoming appreciated and that the odium attaching itself to the tiller of the soil, which pictured him as a "rube" with his pants in his boots and hayseed in his hair — a natural victim for any sort of confidence man — is passing away. Such an individual rarely existed. The farmer is appreciating the dignity of his calling and that it is more honorable to follow the plow than the bulls and bears, also that they who follow the latter quite often become shorn lambs.

MORTGAGED FARMS

Much has been said about mortgaged farms. What are the facts? There are 72,311 farms mortgaged — 35,487 less than half the total number. The sum of farm mortgages is \$97,309,848, or an average of \$1,346 for each farm mortgaged — surely not an alarming amount. This does not indicate poverty, but rather thrift. The man who purchases a farm — if he has no other resources — must raise his money on his land, just as the merchant must raise his, under like conditions, on his stock of goods. Paying off the mortgage has been the making of many a man. It has stimulated him to secure a home for himself, and has taught him

lessons of thrift and economy, worth in themselves many times the effort. Of course, there are instances where the mortgage has been as a millstone about the neck and has brought gray hairs with sorrow to an untimely grave; but these were the results of poor judgment, overconfidence, or unforeseen economic changes, such as took place after the opening of the virgin prairies of the West, easy now to understand from a backward look, but not so easily foreseen a half-century ago. The song often sung in our granges—"Do Not Mortgage the Farm"—is one of those dangerous half-truths to which I have alluded and, unqualified, is not good advice.

UNPRODUCTIVE LANDS

Much cheap sentiment has been indulged in relating to the so-called abandoned farms of New York and New England. As a matter of fact, of those really abandoned in the sense that nothing is done with the land, there are comparatively few. Many such ought to have been abandoned a generation ago. If one stops to consider, it will be seen that, had this country been settled from the Pacific eastward, thousands of acres that were taken up because of their accessibility by the early settlers in the East would never have been touched by the plow. It is a sign of intelligence and progress when men come to realize that to spend their energies in wringing a scanty living from a naturally sterile soil on the hill-sides, away from markets and the refinements and advantages of the centers, is a useless waste of energy and a deprivation of those things that make life worth while, when less effort would bring manifold more returns if expended in the valleys, which are crying for workmen. At best, on these back hill farms, they can only exist, nor can they expect the succeeding generation to remain there unless such are deficient in vision. A region peopled with this sort of folk soon deteriorates into a condition of things both degrading and pagan. Far better let such land lie idle or be attached to fertile lands in the valley as pasture or woodlands. When the time comes that there is an increase of population and the better lands are utilized to their full measure of production—which as yet has not come to be approached—such lands may again be profitably farmed, but not now.

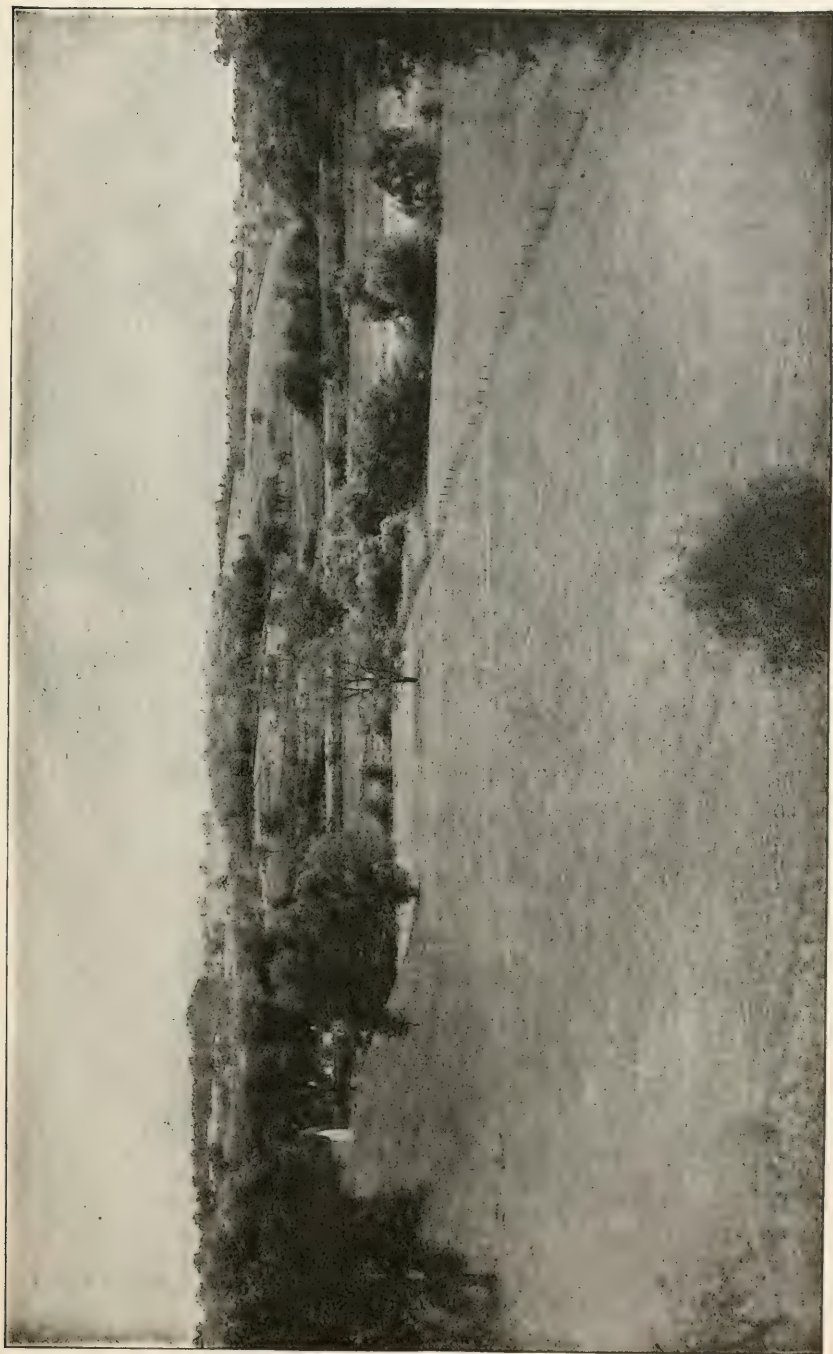


FIG. 552.—FARM LAND IN THE HUDSON VALLEY

PROSPECTS FOR FORESTRY

This naturally brings us to the matter of forestry, something well worth the attention of every one interested in the development and conservation of our state resources and of those who have funds to invest, but not calling for an immediate income. According to figures recently presented by Dean Baker of the State College of Forestry, the present average income from New York agricultural lands is from four to six dollars per acre. The Black Forests of Germany return from two to four dollars per acre; Saxony receives as high as six dollars per acre from her forest lands. New York shows an area of idle lands greater than the combined area of Massachusetts, Connecticut, and Rhode Island. There are nearly two million acres in the Adirondacks and Catskills. A recent survey of forest conditions in four hill counties in the southern part of the state showed half of their area covered with woodland, yet the farmers were paying a high price for lumber from the Pacific coast and other territory nearly as remote. The lessons and deductions are obvious.

NEW YORK'S REAL PLACE IN AGRICULTURE

Thus far we have contemplated the less pleasing side of the picture, yet one most necessary to have very clearly defined. Having this as a background, it is pleasant to consider other facts much more attractive. In the past decade there has been an increase of 35.7 per cent in the value of farm property. Land shows an increase of 28.4 per cent and buildings 41.6 per cent, indicating that farmers have the funds to make improvements. Even more significant is the increase in the value of implements and machinery, of 49.3 per cent. Domestic animals show an increase of 45.8 per cent. The value of all property per farm is \$6,732, an increase of 42.7 per cent.

New York ranks first in the value of hay and forage — \$77,360,645.

New York ranks first in the production of potatoes, with 48,597,701 bushels, valued at \$20,338,766 — an increase in ten years in value of \$5,319,631, or 35.4 per cent.

New York ranks first in the value of vegetables (excluding potatoes), with \$15,963,384.

New York ranks first in the value of small fruits produced — \$2,875,495.

New York ranks first in the number of bushels of apples produced — 25,409,324 bushels.

New York ranks first in the value of flowers and plants — \$5,148,949.

New York ranks first in nursery products — \$2,750,957.

New York ranks first in the dairy industry. An increasing proportion of its dairy products is sold as market milk.

New York ranks second in acres among the states in the production of hay and forage. The amount reported in 1910 was 7,055,429 tons, valued at \$77,360,645.

New York ranks second in the value of pears produced — \$1,418,218.

New York ranks second in the value of grapes — \$3,961,677.

New York ranks second among the states in the amount expended for labor — \$41,312,014, exceeded only by California.

New York ranks second in value of forest products of farms — \$10,365,651.

New York ranks third among the states in the production of beans, having 115,698 acres, valued at \$3,689,064.

New York ranks third in the number of orchard trees of bearing age — 17,625,093; the trees not bearing, 7,363,614. Number of bushels produced is 29,456,291, valued at \$17,988,894.

New York ranks third in the value of peaches produced — \$2,014,088.

New York ranks fourth in the value of plums and prunes produced — \$519,192.

New York ranks fifth in the value of cherries produced — \$544,508.

New York ranks fifth in the value of nuts — \$74,420.

New York State ranks eighth in a list of nine states producing a value of crops over \$200,000,000 each. The following table shows the acreage and value of crops reported by acres, and the total value of all crops:

<i>Rank</i>	<i>State</i>	<i>Acreage of crops</i>	<i>Value of crops reported by acres</i>	<i>Value of all crops</i>
1	Illinois	20, 273, 916	\$362, 464, 951	\$372, 270, 470
2	Iowa	20, 374, 925	304, 491, 033	314, 666, 298
3	Texas	18, 389, 092	287, 295, 880	298, 133, 466
4	Ohio	11, 431, 610	215, 250, 975	230, 337, 981
5	Georgia	9, 662, 383	214, 463, 237	226, 595, 436
6	Missouri	14, 335, 588	204, 286, 256	220, 663, 724
7	Kansas	19, 900, 750	211, 485, 723	214, 859, 597
8	New York	8, 387, 731	174, 475, 689	209, 168, 236
9	Indiana	11, 331, 395	193, 395, 392	204, 209, 812

From the above figures may be found that New York stands second in the value of product per acre of such crops as are reported by acres, the states ranking as follows:

<i>Rank</i>	<i>State</i>	<i>Value of product per acre</i>	<i>Rank</i>	<i>State</i>	<i>Value of product per acre</i>
1	Georgia	\$22 20	6	Texas	\$15 62
2	New York	20 80	7	Iowa	14 94
3	Ohio	18 83	8	Missouri	14 25
4	Illinois	17 88	9	Kansas	10 63
5	Indiana	17 07			

The above presents a correct statement as to New York's agricultural conditions. I have tried to make it plain that many of the low-priced lands, over which so much sentiment has been and is being wasted, are not an important factor in present-day agriculture — that these low-priced lands are not cheap lands. The real measure of land value is its productive power. We have not begun to touch the capacity of our real agricultural lands. As fast as compensation warrants — and no faster — will their products increase.

In 1910, I was invited to a so-called conference of the Board of Trade of this city. Mr. Brown, then president of the New York Central Railroad, delivered an address on our danger from a lack of production. By a chart he showed that by 1913 we should have absolutely nothing to export, and according to the figures displayed we should soon not be able to feed our own people, unless the ignorant, thoughtless farmers took lessons from mighty men of valor like himself, whose farming is purely academic. Yet, behold, 1913 is past, our own people have had abundance, and the products of our fruitful fields have gone to feed the armies of the Old World. The year past has witnessed the greatest wheat crop ever known, and all without a ripple of excitement or of apparent

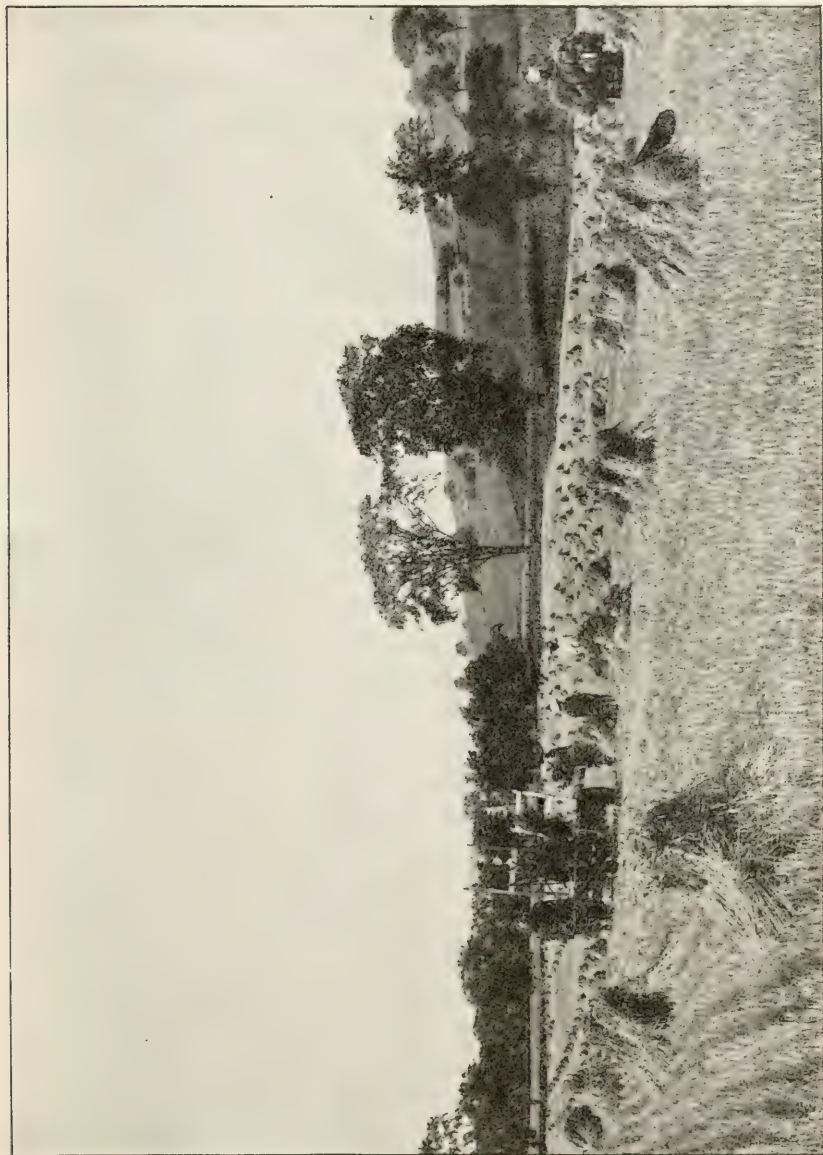


FIG. 553.—FORTY-SIX BUSHELS OF WHEAT PER ACRE

effort. The demand was great. This — as always — enhanced the price, and consequently the farmers were ready and able to supply the demand.

THE CITY MAN'S HUNGER FOR LAND

This brings me to the second part of my theme. Without doubt, there is inherent in every man a desire to possess a portion of the earth of which he shall be the lord and master. Coupled with this, there is in most of us a delight in watching the development of plant and animal. This is nothing new, for from the time when "the Lord God planted a garden eastward and set man to dress and to keep it," down through the ages when Horace was glad to return to his Sabine farm, and in the time of Virgil and Nero, when men talked in the market place of soils and plants, this feeling has existed.

In the last decade this eternal lure of the land has been brought to the surface by present-day conditions. Owing to changed economic conditions, men everywhere have begun to look at agriculture from a different standpoint. "The stone [of agriculture] which formerly the builders rejected has now become the headstone of the corner." The farmers as a class have prospered, although they have not grown rich in money, and they have brought into their lives as never before those things that go to make abundant life. Men have come to weigh values and to realize that real riches do not consist in stocks and bonds and costly dwelling places. As the life in the city has become more complex and the struggles more keen, and the rewards for such struggle have been found to be inadequate, what wonder that men cooped within brick walls and following a treadmill existence should long to break these bonds asunder and cast away these cords from them, and long for the "green pastures beside the still waters" ?

A while ago I met such a man by appointment in this city. He told me of his successful business career; of the salary he was getting — it seemed large to a farmer; of his work taking him far afield for long periods; of his home in an uptown flat, not knowing who were above or below him, on his right hand or his left; and of his privilege, if he wanted air or sunshine, of opening a window to let in such homeopathic quantities as overhanging brick walls permitted. He told how he must procure his food from day to day,

as the children of Israel gathered the manna, without its freshness, summing it all up by the pathetic exclamation — “What do I get for my money compared with what you do for yours!”

Verily, there is a hunger not satisfied with bread. As in olden times, men may have their heart's desire, but with it a leanness of soul. As these things begin to be realized there comes a voice telling of the “fat of the land,” of “cattle on a thousand hills,” and of “trees bearing all manner of fruit”; of green fields and ripening harvests, and of a life of independence. There are also marvelous wonder tales — alas, some of them in our agricultural papers — such as of a man and his son in poor health with a little capital, who invested in a few hens, these soon growing into thousands, making a profit of \$4.96 per hen; of melons at 25 cents per pound; and of certified milk at from 16 to 20 cents per quart — all tales of such munificence that “imagination's utmost stretch in wonder dies away.” All of this apparently grows without effort while the farmer sleeps; all he has to do is to read a few books, listen to a few lectures, buy some land, secure an hireling, and he will be able to “sit and sing himself away to everlasting bliss.”

The above is not overpainted. It is not serious for the individual if he has sufficient means to pay for his imagination's leadings and his expected bliss; but, oh, the pathos of it when a man, utterly ignorant of even the elementary principles of agriculture, leaves a good position and ventures his little all on a farm, the victim too often of some land shark, and again the victim of the men whom he employs. How utterly absurd to expect respect or service from an employee, when the employer is the servant because of his lack of knowledge concerning the business of which he assumes to be the head! Would anyone but a fool undertake such in any other calling? Neither is this a fancy picture. I could more than one tale unfold, which, if it did not harrow up your blood, would incite your laughter and your pity.

Think of the man wanting to buy sixty bushels of clover seed to sow on sixty acres at ten dollars per bushel! Fortunately, he struck an honest dealer who sold him only ten. Had he consulted his neighbors, who knew the conditions, he would have sowed none and saved his hundred dollars. Enough of this! I have

drawn the line sharply, not with the thought of discouraging anyone who is consumed with land hunger, but that by such sharply drawn lines I may point out the absurdity of one not country-bred or farm-minded, utterly devoid of knowledge of the most complex business on earth — of what I may call farm etiquette, for there is such — to expect to succeed from an economic standpoint when one to the manor born rarely makes more than a good living.

WHO SHOULD FARM

As already stated, the man who has the means to gratify his agricultural desires may buy land and play at farming, but let him not call himself a farmer until he has demonstrated his ability to live from his farm. Occasionally, some do. More often the toy proves too costly and annoying, consequently there is a real, abandoned farm, left in such condition that no real farmer wants it.

There is also the man who is farm-minded, in that he knows farm conditions, is willing to work and devote himself to his business as any successful man must do in the city, who has enough money for his investment and a working capital over, and who is not wise in his own conceit, realizing that the practices of the neighborhood are usually the outgrowth of years of experience, and, while susceptible of improvement, should not be lightly ignored.

The young man with very little capital or farm experience who thinks at the beginning of his career that he would like to be a farmer may make a success if he will gain his experience as the employee of a real farmer, being willing to work for what he is really worth, which at the outset will not be much. By so doing, he can determine without financial loss whether he really wants to pay the price of being a farmer. All things worth while have a price, and the more intrinsic worth they have the higher is the price — most often not in dollars. He can gain an experience that he must have and that cannot be obtained from any text book or school.

AGRICULTURAL EDUCATION

Unfortunately, an opinion seems to obtain that if a man takes an agricultural course — short or long — he is bound to come out a full-fledged farmer. No one holds an agricultural education in

higher esteem than the speaker, but how absurd to expect to take a course of few weeks or months and get any more than the rudiments! Many have an idea that an agricultural college graduate is the beau ideal farmer. He may be, if such course has followed an apprenticeship on the farm. To expect proficiency after only a technical training is to expect the impossible; as in law, medicine, engineering, or any other science, there must go with the technical training the practical experience before men will engage the services of such students.

THE FARM TO BUY

I cannot refrain from saying a word before closing as to the character of the farm. Remember, I have said that the low-priced lands are not usually the cheap lands; the value of land depends upon its earning power. Here is a real case to illustrate: A young man came to me for information concerning a certain farm of about 150 acres, the purchase-price being \$7,500. It was several miles from market, on a byway, a quarter of a mile from the highway. At least \$1,000 should have been expended on the house and barn. There were about eighty apple trees on it, but it was not orchard land. It is a fair farm for hay and grass, or stock, but it had been leased for several years, the owner being too old to work it longer. Under his management, produce from it had sold for as much as \$1,500 gross in good years. I had difficulty in making the young man see that he, a novice, could scarcely expect to obtain as much at the same outlay; and that, when he estimated interest, taxes, upkeep, and labor, he might expect to work at least ten years for his board. I asked him if there were no other farms about—for he liked the neighborhood—and he cited one a little larger for \$15,000. It had much better buildings, it was only a half-mile from an electric railroad carrying both freight and passengers, and it was within four miles of a boat landing on the Hudson River and the New York Central Railroad. On it were not less than 500 bearing apple trees and as many pear trees, all good varieties and in good condition. Besides, about ten acres of alfalfa had been established. This farm would produce fully three times as much as the other, and in fruit years much more, and was really a cheap farm at



FIG. 554.—TYPE OF HOUSE AND BARN ON CHEAP LAND IN NEW YORK STATE

double the price of the other. Had I been loaning money I should have expected a good farmer on the latter land to repay the \$15,000 soon, while on the other I should have been satisfied to obtain my interest.

Much has been written about bringing up poor land, all of which is true, but to take run-down land and build it up when obliged to live from it is a task I would not wish on my worst



FIG. 555.—TYPE OF BUILDINGS ON GOOD FARMS IN NEW YORK STATE

enemy. It is a case of “hope deferred maketh the heart sick.” In any event, one can far better afford to pay much more for land in good condition, even if one has the means to build the poor land up, for in the end the latter will cost much more than the good. Of course, I refer to land from which the vegetable matter and available plant food has been farmed out—not to productive, undrained land, full of fertility if properly handled.

LOCATION AND CHARACTER OF SOIL

A farm is one's home; therefore, a desirable location as to schools, churches, and social centers, as well as to beauty of situation, are matters wholly apart from production, and are of inestimable value, in even a single lifetime. Nearness to markets and good roads are always economic factors. Hill land may be picturesque and sometimes productive, but it is hard to work. The character and depth of the subsoil is as important as the surface. It is always desirable to have heavy and light soil on the same farm. This admits of a greater diversity of crops and enables one better to meet extreme conditions of drought or over-abundant rainfall, besides allowing for much greater freedom in the handling of both soil and crop.

SIZE

Many surveys have shown that under average conditions a farm of 200 acres is most desirable. The same house and comparatively little more capacity in buildings will serve as on a farm of half the size. This is true of farm machinery and, to a less extent, of horses. One can diversify much better on a larger farm. With now and then a notable exception, diversified farming is and has been most profitable. Labor can be employed by the year. A good farmer should be able to make a profit on his laborers, as many tasks can be done much better by two or three men than by one. The farmer himself will not have to labor so hard as when he is obliged to do most of the work himself. Of course, there are some men, who, as an old uncle of mine used to say, "are only fit to tread in a half-bushel." Such men would be out of place on a large farm. Blessed is the man who has found his capacity.

I have spent more time in presenting the subject than I had intended, but it is hard to crowd the experience, observation, and philosophy, gained in forty years' contact with the soil and men and things, into a half-hour. To those of you who have the land hunger, I can do no better than quote the lines of Kipling, with three words added:

If you can keep your head when all about you
Are losing theirs and blaming it on you;
If you can trust yourself when all men doubt you,
But make allowance for their doubting, too;
If you can wait and not be tired by waiting
Or being lied about — don't deal in lies —
Or being hated — don't give way to hating,
And yet don't look too good nor talk too wise;

If you can dream — and not make dreams your master;
 If you can think — and not make thoughts your aim;
 If you can meet with triumph and disaster
 And treat these two impostors just the same;
 If you can bear to hear the truth you've spoken
 Twisted by knaves to make a trap for fools,
 Or watch the things you gave your life to broken,
 And stoop and build them up with worn-out tools;

If you can make one heap of all your winnings
 And risk it on one turn of pitch-and-toss,
 And lose and start again at your beginnings,
 And never breathe a word about your loss;
 If you can force your heart and nerve and sinew
 To serve your turn long after they are gone,
 And so hold on when there is nothing in you
 Except the will which says to them, "Hold on!"

If you can talk with crowds and keep your virtue,
 Or walk with kings — nor lose the common touch;
 If neither foes nor loving friends can hurt you;
 If all men count with you, but none too much;
 If you can fill the unforgiving minute
 With sixty seconds' worth of distance run,
 Yours is the earth and everything that's in it,
 And — which is more — you'll be a man, my son.

— and can farm.

BUILDING UP THE DAIRY HERD THROUGH BREEDING

O. C. BOWES

Agricultural Department, Columbia University

In any discussion of animal breeding, it is interesting to contrast the theoretical phase of the subject, which has been taken up by the geneticists, with the more practical aspect, represented by the empirical findings of the animal breeder for several generations. Much of the material from the science of genetics is of too recent finding to be properly correlated and to be generally applicable to practical breeding operations. Much has already been done which offers explanation for some of the disappointments of animal breeding in the past. In this paper, most emphasis will be placed upon the findings of practical breeders.

One of the early writers on dairy cattle breeding, Thomas Bates, emphasized as early as 1807 the great practical value of cattle tests. Milk, butter, and cheese were in his opinion of equal importance with beef in the selection of a breed of cattle. Their function was to yield milk in the first place and then make a handsome residue for the butcher. The history of the "milking shorthorn" has demonstrated the correctness of his views.

The modern tendency in dairy cattle breeding has been decidedly away from the Bates or dual-purpose type of dairy cow. Experience has demonstrated fully that with exceptional care the specialized dairy cow is more efficient in the production of food products than the intermediate dual-purpose cow. While a few geneticists maintain that it is possible to obtain both maximum milk secretion and beef production from the same animal, I believe the recent knowledge obtained regarding milk secretion will show the fallacy of this contention.

We have in this country several well-defined and specialized dairy breeds, and the improvement in their production has been very rapid indeed. Probably much of this improvement has been due to our knowledge of feeding and care, but a great deal also has been accomplished by breeding. Our systems of breeding have been largely based on the principle of "mass selection," that is, selecting our breeding stock from the high-producing animals. This is apparent from our methods of keeping records, our cow-testing associations, our selection by means of the score card, and the high prices paid for high-producing females and their offspring.

The work of Johannsen pointed pretty definitely to the limits and possibilities of improvement by selection — that it is only a screen by which the poorer animals of a breed may be eliminated and the good ones kept; that it is not possible to obtain any added improvement by this method. This is in accord with the records of many of our experiment station herds all over the world. These records show that the average production of cows through a series of years fluctuates, and may or may not be better after several years' breeding where all possible care has been exercised in the selection of breeding sires.

We now recognize that mass selection not only does not give added improvement to a breed, but does not permit of the maximum improvement that is possible in animal selection. While it is not possible to isolate lines of inheritance and to insure their transmission with such certainty in dairy cattle as it may be with some plants, it is possible to apply those principles to a much larger degree than we have applied them in the past. Owing

to the bisexual reproduction, a dairy cow that will "breed absolutely true" is practically impossible to obtain; but that we can approach much nearer to this ideal than we have in the past has been demonstrated in the last few years.

To illustrate this principle by a practical example of what we should strive for in the selection of our breeding cows and sires, it is easiest to consider the animal's pedigree. It is not enough that her sire has produced good offspring or that her dam produced a large amount of milk, but we should also know what her sisters are producing, and what the ancestry for several generations



FIG. 556.—THE DAIRY TYPE

have produced. This is no longer impossible, since we have the advanced registry records. If the production has been uniformly good throughout a number of generations, we have much more reason to expect that the individual we are considering will be a good one than if she came from a high-producing animal whose relatives were poor producers.

We should not overlook in a discussion of animal breeding the great improvement that has been accomplished by what we know as "grading," that is, by the use of pure-bred sires on grade or

mixed cattle. While this latter conception of grading is the one that is generally meant, we should remember that when in pure-bred herds we use sires that are inbred we are still employing the same principle. The Mendelian explanation of grading and the improvement that is possible by this method of breeding depends upon the purity of the reproductive cells. The fact that a pure-bred sire can fix his characters, and consequently those of his ancestry, upon a grade herd is due to the greater purity of those characters in his germ cells. By using the first method outlined in this discussion for the production of breeding stock and by then using pure-bred sires to improve our grade cows, we can hope for the best improvement in our dairy cattle.

PROFITABLE FEEDING PRACTICES FOR THE DAIRY HERD

O. C. BOWES

Agricultural Department, Columbia University

It has been customary in recent years to point out the dairy cow as an efficient machine for converting rough feed on the farm into marketable human food products. It has been shown that she is more than twice as efficient in the production of dry matter as the beef steer. When beginning to feed dairy cows for the first time, people are usually impressed with the great capacity for food possessed by them. Beginners will be more likely to under-feed than the reverse. This capacity to handle large amounts of food is perhaps the most valuable asset of the dairy cow; it enables her to have a large reserve food supply above her maintenance requirement for production of milk. The ability and knowledge of the feeder to feed so as to allow the cow full use of her capabilities will be the determining factor in the economical production of milk.

In this country a great deal of effort has been devoted to elimination of the "boarder cow" from our herds, apparently without realizing that this is only a relative term, and that the "boarder cow" will be with us in the future as she has been in the past. While it may be highly advantageous to have cows of great capacity excessively fat when they freshen, for the mediocre cow it is not necessary and may not be economical.

Fundamentally considered, attention is directed to the study of cattle feeding to cheapen the cost of production. Most of us will agree that the farmer plays a minor part in determining the selling price of his milk. He can, however, materially cheapen the cost of producing it by taking advantage of market conditions as to feed. It has been demonstrated by exhaustive experiments that when grain is high in price the average cow can be fed abnormally large amounts of roughage to advantage. During the present winter some dairymen have fed large amounts of alfalfa and reduced the grain ration. Experiments have shown that eleven pounds of alfalfa hay will replace eight pounds of wheat bran in the daily ration of a cow that is not producing an excessively large amount of milk. The same can be said regarding the feeding of roughage in developing the dairy heifer. While the general effect of feeding a large amount of roughage and a small amount of grain may retard, to a slight extent, the maturity of the heifer, the physiological effect will be good in accustoming the alimentary tract to handling rough feed and consequently in developing large stomachs. Almost the reverse situation seems to take place when a high grain ration is fed to the developing heifer. In this case the heifer grows rapidly and matures earlier than when less grain is fed. It is not always economical, however, to feed a high grain ration.

The modern system of feeding dairy cows always presupposes the feeding of large amounts of roughages; and, as a rule, the more of this that can be grown at home the more economical it will be for the farmer. In almost all cases silage is the principal roughage fed with other forages such as alfalfa, mixed hay, soy beans, cow peas, oats and barley, etc. In many cases silage is fed both summer and winter where pasture is likely to be deficient. Soiling — that is, cutting feeds while still green and hauling directly to the barn to be fed while still in a succulent condition — while not practiced to such an extent as it was before the silo came into such general use, is still sometimes advantageous for short periods during the summer when the cows may be tiring of the silage or when the silage is short in quantity.

The astonishing results of Detrick, who was able to raise all the roughage needed for thirty head of cattle — seventeen of which

were cows in milk — on seventeen acres, may some day prove to be a very practical plan for many farmers. Under conditions general at that time, also at present, such intensive methods are not necessary nor are they generally profitable. The feeding of grain to cows in order to get maximum milk production is necessary, both summer and winter. While there may be times when the pasture is so good that it is less economical to feed grain, an addition of a small amount of grain will cause an increase in the flow of milk.

On many farms most of the grain fed to cows has to be purchased, and on some successful dairy farms all the grain is purchased. On the average dairy farm too much of the proceeds from the sale of milk is spent in purchasing feeds. When a dairyman has gross receipts of \$2,000 a year and a feed bill of \$1,400 to \$1,600, it is not hard to see that milk is produced at the expense of some other part of the farm. Many farmers have reduced this cost of purchased feeds by growing better grades of roughage and by weeding out unprofitable cows in their herds.

Milk production, when looked at from a farm-management point of view, does not differ from any other business of production; and the business principles relating it are readily learned by the man who applies himself. The art of feeding is not so easily learned; and to some, who are temperamentally not fitted to be feeders of animals, it will always remain a stumbling block to success.

CLEAN MILK; ITS PRODUCTION AND IMPORTANCE TO PRODUCER AND CONSUMER

PROF. C. W. LARSON

Columbia University

Milk is a food product, and it should be produced and handled as such. Because of its nature, it is very easily contaminated with disease germs, and for this reason every person in any way connected with the handling of milk should be scrupulously clean in his methods. It forms the entire diet of tens of thousands of infants, children, and sick and convalescent persons, who are least able to resist the effects of unclean milk.



FIG. 557.—SANTARY STABLE AT STATE AGRICULTURAL EXPERIMENT STATION, GENEVA

Milk is a cheap, complete, and easily digested food. In food value, a quart of milk is equivalent to three-quarters of a pound of sirloin. It contains all the essential elements for a complete and balanced ration.

CLEAN MILK

Clean milk contains few living organisms, or "bacteria," as they are called, and little or no visible dirt. Milk as it comes from healthy cows is pure, so that the secret of producing clean milk is simply to prevent as completely as possible all chances for dirt and bacteria to find their way into the milk, and then to keep the milk cold so that those that do get in will not multiply. It is dirt and bacteria in milk that cause it to spoil. Milk that is produced by clean methods and kept cold will remain sweet for many days.

CLEAN STABLES

Milk readily absorbs odors and flavors; therefore, a stable in which cows are kept should be clean, especially during milking time. If silage is fed, it should be given after milking and should be cleaned up before the next milking period. The stable should be so constructed as to afford little chance for dirt to lodge. Floors that can be easily cleaned and that will not absorb liquid manure should be used. Cows should not be fed hay or other dusty feeds, nor should bedding be distributed during milking time. The dust thus raised falls into the milk and carries bacteria with it. Abundance of light and fresh air are essential in a dairy barn.

CLEAN COWS

Most of the dirt that finds its way into the milk falls from the bodies of the cows. It is essential, therefore, that the cows be kept clean. The platform on which the cows stand should be short enough to allow the manure to drop into the gutter; an adjustable stanchion will naturally assist. This is important in keeping the cows clean. Cows that are kept in the stable need to be groomed, but this must be done sufficiently long before milking to permit the dust to settle. Wipe the cows' udders and flanks with a damp cloth; this requires only a short time and will do

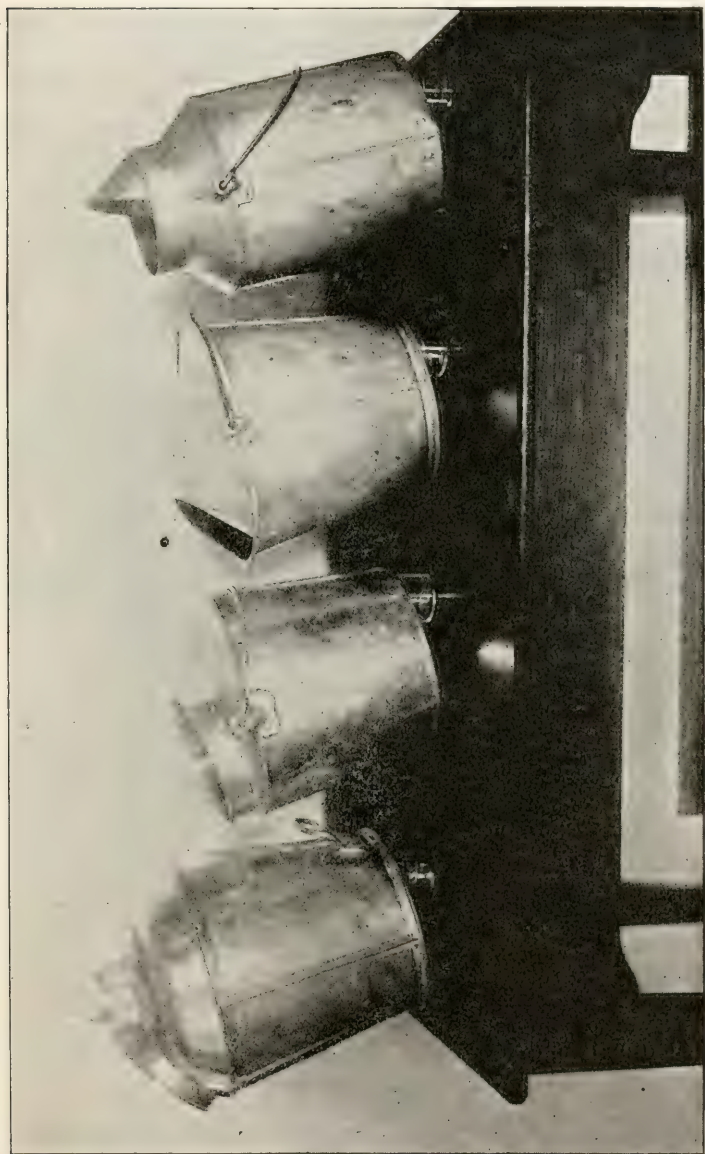


FIG. 558.—DIFFERENT TYPES OF SANITARY MILK PAILS — COUNTING FROM THE LEFT, THE THIRD TYPE IS MOST COMMONLY RECOMMENDED

much to remove dirt that would otherwise fall into the milk. The practice of clipping the hair on the udders, flanks, and thighs occasionally lessens the difficulty of keeping cows clean.

CLEAN, DRY HANDS

The milkers' hands must be clean in order to produce clean milk. Too often, milkers clean up the stable and do other work and then sit down to milk without washing their hands. The practice of first wetting the hands with milk is deplorable. It is unnecessary and one of the most unclean practices.

SMALL-TOP MILK PAIL

To many producers the small-top milk pail seems impracticable and unnecessary; but on the contrary it has been thoroughly demonstrated that with a little practice this style of pail can be used as easily as the open one, and will exclude much dirt. Most of the dirt that gets into the pail falls from the cows during the milking. Therefore, if, for instance, the top of a pail is covered so that only one-sixth of the surface is open to catch the falling dirt, only one-sixth as much dirt will get into the milk.

CLEAN TINWARE

All pails and cans used for milk should be of metal, with all corners and joints completely filled with solder. Every crevice makes a place for milk to lodge and contaminates the next milk that goes into the vessel. In washing tinware, it should first be rinsed with lukewarm water, then thoroughly scrubbed with a brush, and finally either steamed or rinsed with boiling hot water. Cloths should never be used for either the washing or the drying of tinware.

MILK ROOM

As soon as it is drawn, milk should be removed to a clean, well-lighted room. It should not be left in the stable.

STRAINERS

A strainer will remove particles of hair or large pieces of dirt, but will not strain out bacteria. The ordinary cheesecloth strainer that is used day after day usually contaminates milk instead of

purifying it. What is considered by most people to be good washing does not make such strainers sufficiently clean to pass milk through them. The metal strainers, or the cotton strainer made especially for the purpose and used only once, are better. Where milk can be produced by clean methods, no strainer is necessary.

KEEP MILK COLD

The sooner milk can be cooled, the better. It is almost impossible to produce milk without some bacteria in it, so that the problem now is to prevent these bacteria from increasing in number. At a temperature of seventy degrees, one bacterium may increase to two in twenty minutes; while at fifty degrees it requires a very much longer period. One bacterium in milk at fifty degrees may increase in twelve hours to six or seven, while at seventy degrees it may increase to 600 or 700. When, therefore, it is remembered that much apparently good milk contains many thousands of bacteria per cubic centimeter, which is about thirty drops, it is readily seen how soon millions of bacteria will develop when the milk is warm. Milk should be cooled as soon as possible to fifty degrees or lower, and kept at that temperature. The following table prepared by Professor Stocking shows the importance of keeping milk cool. The milk used in this experiment was clean and of high quality.

EFFECT OF DIFFERENT TEMPERATURES UPON THE DEVELOPMENT OF BACTERIA
IN MILK

<i>Temperature maintained for 12 hours</i>	<i>Bacteria per c.c. at end of 12 hours</i>
40 degrees F.....	4, 000
47 degrees F.....	9, 000
50 degrees F.....	18, 000
54.5 degrees F.....	38, 000
60 degrees F.....	453, 000
70 degrees F.....	8, 800, 000
80 degrees F.....	55, 300, 000

COOLERS

Various styles of apparatus are on the market for cooling milk. The open type that is so common should be kept in a clean room, free from dust, to prevent the contamination of milk during cooling. In a dusty room, millions of bacteria may be added to milk

while it is being poured over an open cooler. The cooler with few joints and one that can be easily cleaned should be selected. When it is not necessary to prepare the milk for immediate shipment, it may be cooled by placing the cans in cold water. Ice should be used during the very warm weather where the water is not of low temperature or is of small volume.

GREENHOUSE VEGETABLE PRODUCTION

PAUL WORK *

Superintendent, Department of Vegetable Gardening, Cornell University,
Ithaca, N. Y.

Time was when the housewife assumed that vegetable food would be served during the summer and fall months of the year, and when she likewise assumed that it was unavailable during the winter and early spring months. Every effort on the part of growers, greenhouse and transportation men, and canners to make such food supply available throughout the year has been gratefully welcomed. The development in the use of glass has been one of the most important factors in this movement.

There are two ways in which glass is of service in lengthening the season for vegetable foods. It is used for starting early plants, which may be transplanted to the open ground, and which will consequently yield their products earlier than if the seed had been sown in the field. Glass is also used for growing crops to maturity and thus delivering them to the consumer far outside their normal season. The latter type of activity is commonly spoken of as vegetable forcing or greenhouse vegetable production, and to this we will confine our present discussion.

THE MOST INTENSIVE FORM OF AGRICULTURE

Vegetable forcing shares with greenhouse floriculture the distinction of being the most intensive form of agriculture. Intensive agriculture involves the control of a larger proportion of the growth factors than does extensive agriculture. The wheat grower of the West exercises but slight control over soil conditions, and contributes comparatively little to the production of the crop.

*As Mr. Work was unable to be present, a lecture was delivered by Mr. W. B. Nissley, School of Agriculture, Farmingdale, L. I.

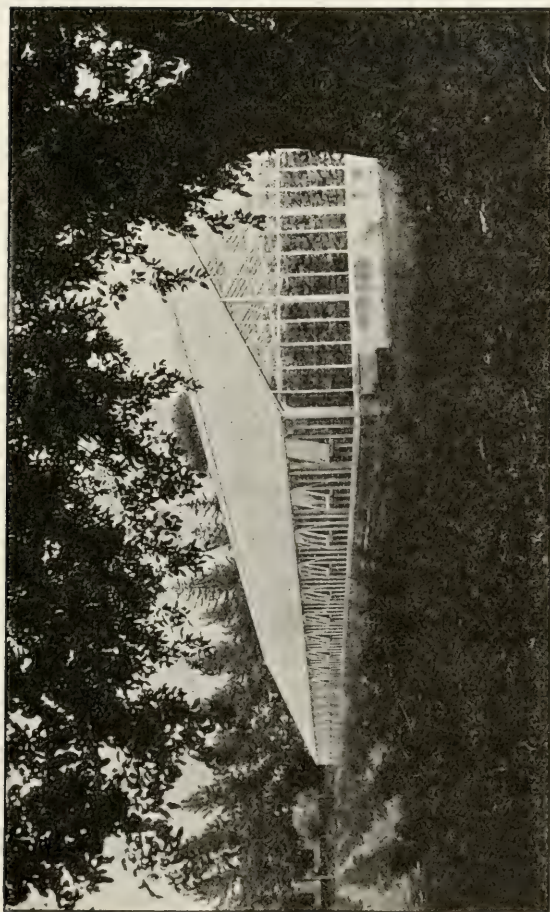


FIG. 559.—A MODERN VEGETABLE HOUSE

The truck farmer modifies a much larger number of factors, and in a much higher degree. As market gardening is still more intensive, the greenhouse man finds it necessary to supervise, not only the physical and chemical properties of the soil, but also to furnish all of the moisture that is required, and to regulate the temperature both by protection against the rigors of the weather and by supplying artificial heat; and, further, he must regulate the quality of the atmosphere by ventilation.

The larger the share that man assumes in crop production, the more difficult does the task become. A control of temperature and ventilation is by no means as simple as is the modification of the physical and chemical character of the soil by tillage and fertilization. Thus, vegetable forcing is a highly technical, and withal a highly difficult, business.

It is a phase of vegetable production that should not be undertaken by the beginner save in connection with other less intensive work, and one that should be entered upon gradually, thus avoiding the heavy losses that may result from large investments before sufficient knowledge and experience have been gained. Even for the most skillful grower, results are a bit more precarious than in outdoor operations.

The use of glass fits well with market gardening. It makes possible the employing of labor to good advantage throughout the year, and thus holds the better employees from season to season. It makes possible a good distribution of income, reducing the interest charge incident to a large running account at the bank. It makes possible the keeping in contact with the trade throughout the year, thus assisting in the ready sale of all the farm products. Further, the glass that is used for starting early plants during a few months of the year is profitably employed in vegetable forcing throughout practically all of the remaining months. Nowadays, greenhouses are idle for not more than four weeks in the year, and frequently for less.

LOCATION

In selecting a location for vegetable forcing, it is necessary to consider a number of factors. An ample and absolutely reliable supply of water is essential. The site should be favorable as

regards exposure to sunlight and protection from cold winds. The greater the number of hours of sunshine during the month, the smaller the coal bill. Manure and fuel must be accessible. The soil on the immediate site ought to be such that it can be readily adapted to this very intensive form of agriculture, or, at least, such soil ought to be within a very short haul. A sandy loam of excellent physical quality is needed. The fertility of the new soil is less important, because it must be radically improved in any case. Finally, a good market and ample means of reaching it must not be forgotten.

EQUIPMENT

Frames

The equipment for vegetable forcing may be of various forms. The simplest is a cold frame, which consists merely of an inclosure,



FIG. 560.—SIMPLEST FORM OF MANURE HOTBED—THE FRAME IS PLACED ON A PILE OF FERMENTING MANURE

perhaps eight to fifteen inches deep, covered with glass sash, or even with cloth. At times, additional protection is given in the form of mats of some kind.

When such a frame is heated by means of fermenting manure or by pipes from a hot-water or steam boiler, it becomes a hotbed, and may be used throughout a greater proportion of the year.

Houses

Simple greenhouses are sometimes built from sash, but the newer types are built with especially designed frames. The cheapest form of construction for large areas consists in ridge-and-furrow houses, 15 to 30 feet wide, with posts at gutters and, in the wider ones, at the ridge. Such houses are very widely used and are giving excellent results; however, those who have capital available and are interested in permanency are showing an increasing tendency toward wide houses built single with substantial iron frames of rafters and trusses. The woodwork of such a house is practically permanent if it is kept well painted. Even after it has deteriorated, it can be replaced without entirely rebuilding the house.

Heating System

Greenhouses are heated in various ways, generally by means of steam or by means of hot water under natural or forced circulation. The tendency is to use hot water under gravity circulation for the smaller ranges and steam or hot water under forced circulation in the larger areas where it is necessary to employ a night fireman.

Fertilizer

Fertility in greenhouses is maintained almost wholly by means of heavy applications of stable manure. The soil is regarded as permanent and is not ordinarily changed, as is the case with most floral houses. The fact that it is not subjected to the rigors of winter frequently renders it necessary to sterilize the soil to keep it free from certain pests, chief among which are certain fungi and minute worms known as eelworms or nematodes.

Water Supply

Water is supplied in such quantity as to meet the requirements of the plant for actual growth of new material and for maintaining the body activities of the plant. An undersupply results in checked growth with increased time for crop production and poor quality. An oversupply results in an unhealthy type of growth and favors the development of crop enemies, as well as delaying maturity and perhaps bringing about actual breakdown of plant tissue.



FIG. 561.—A GREENHOUSE CROP OF TOMATOES AT IRONDEQUOIT, N. Y.

Means of Ventilation

Ventilation is so managed as to keep the air pure and in lesser degree to aid in the control of temperature. Under proper ventilation, plants are more hardy and healthy.

GREENHOUSE CROPS

The leading greenhouse crops are lettuce, cucumbers, and tomatoes. Others are grown to lesser extent, among them being radishes, parsley, melons, beets (both roots and greens), rhubarb, witloof chicory, and others. Ordinarily, lettuce is the backbone of the cropping plan, being grown throughout the winter months. As it requires a lower temperature than cucumbers and tomatoes, it fits in well with the colder season. The cucumber yields good profits, even well into the summer, but thrives under warmer conditions. The tomato fits in a similar place, but is not quite so widely grown. Both of the latter crops may also be grown in the fall, but it is necessary to gain an early start with them if the results are to be of the best. Each crop has its own specific requirements that must be observed to secure the best results, and time does not permit us to go into the almost innumerable details that are involved.

COMMERCIAL AND AMATEUR FLOWER PRODUCTION

EDWARD A. WHITE

Professor, Department of Floriculture, Cornell University, Ithaca, N. Y.

I have been asked to speak this afternoon regarding the flower growing industry, and it gives me pleasure,—for my interests for many years have been centered around this important branch of horticulture. I have been somewhat undecided as to what phases of the subject I had best consider in this talk, for the general subject is a broad one for one lecture. I have decided, therefore, to omit cultural details and speak more especially of flower growing in a general way.

In our consideration of flower growing, the subject shapes itself into a few topics that are clearly defined. The first division is commercial floriculture; other divisions are the growing of plants in conservatories for ornamentation, and the last phase of the

subject is amateur floriculture. This relates more especially to home culture of garden flowers or house plants, which work is usually done for pleasure, but occasionally is developed for its remunerative value.

This afternoon I shall speak more especially of the flower growing industry as it is practiced in New York State, and shall show a few slides to illustrate the various factors in culture.

THE UPLIFTING EFFECT OF FLOWERS ON ALL CLASSES

For years, flowers have played an important part in the life of our American people. They add a distinct charm to any home. We are naturally influenced to a considerable degree by our environment, and when we are placed in surroundings that are destitute of the beautiful we become morbid and depressed; when we are in cheerful environments our mental mood responds in a remarkable degree. So it is that flowers in the sickroom cheer, and flowers on the breakfast table prepare us pleasantly for the day's work.

The development of ornamental features about the home — and flower growing deals distinctly with that — follows step by step the increasing wealth and prosperity of a people. I think you will agree with me that our early colonists paid little attention to home ornamentation. They were too busily engaged in establishing the home and in getting the necessities of life to interest themselves in these things, but with the increasing prosperity that has followed the American people since the Revolutionary War, and more particularly since the Civil War, there has developed an increasing interest in these features; and I think I am right in saying that the present period shows the greatest interest in all lines of ornamental work. To me, one of the most pleasant features of the subject is that all classes of people are interested in flower growing. The wealthy man has his country estate with its broad acres, its greenhouses, formal gardens, and lawns; in the so-called middle class, the business man owns his suburban home with its acre or half-acre surrounding it, which is often laid out with shrubbery and flower gardens; the working man has his backyard plot; and we must not exclude the tenement dweller, with the geranium in the old tin can. Plant life in some form appeals to all classes of people.

THE FLOWER INDUSTRY IN NEW YORK STATE

The production of ornamental plants and cut flowers is an industry that has always centered around the more densely populated sections; hence it is that states having the largest number of large cities lead in this industry. New York State holds the leading place in this respect, the annual production of flowers and plants, as estimated in the census of 1910, being valued at \$5,148,949. There were 1,398 growers who reported an income of more than \$250 on glass-house products of ornamental plants and flowers. The products were grown in an area of 13,876,857 square feet of glass. Other states foremost in flower production are, Pennsylvania with a value of \$3,803,418; Illinois, \$3,694,801; New Jersey, \$2,857,709; and Massachusetts, \$2,455,467.

In New York State the industry centers about New York City. Other large cities are so distributed over the state that the business is not wholly localized in that section, as is true in states having but one or two large cities. Rochester has the distinction of being called the "Flower City of the United States," while Buffalo, Syracuse, Utica, Albany, and several other cities produce and dispose of quantities of flowers and plants.

The present tendency among flower and plant producers is towards specialization. An important limiting factor in specialization, however, is the character of the soil. The ability of an individual to produce some one crop better than anyone else is also an important factor.

VIOLETS

The soil factor has been largely responsible for localizing violet production about Rhinebeck and that section of the Hudson River valley. A few growers made so pronounced a success of the business that it was entered into by a large number of men in that vicinity, many of whom had had little or no experience in flower growing. There are no large greenhouses devoted to this crop, but there are approximately eighty-five growers who have ranges covering from one to three thousand square feet. Only double violets are grown, and they are shipped to all parts of the state,

especially to western New York, where violet growing is not successful. They are also shipped to other states.

ROSES

Rose growing has come to be a specialized industry. The cultural demands of the crop are somewhat peculiar. Roses require soil and sunlight conditions that are found only in certain sections of the state. The American Beauty roses are especially difficult to grow unless there is maximum sunlight, which is essential to produce a clear, rich tint. If the variety is grown under inferior soil conditions, the growth will be weak and the stems short and spindling. If there is a lack of sunlight, the petals will be purple in color, thus diminishing the value of the variety for cut flowers.

The largest grower of American Beauty roses is Paul Pierson of Scarborough and Briarcliff. The Briarcliff establishment is a large one, and the houses are of modern construction. The output of American Beauty roses from this range supplies a large number of New York flower stores, and is of an excellent quality. F. R. Pierson, of Scarborough, also grows this variety, but not so extensively. The majority of American Beauty rose growers, however, are located in Northern New Jersey and Eastern Pennsylvania, where excellent light conditions, combined with good soil and marketing facilities, make the crop a remunerative one.

Among the largest growers of tea and hybrid tea roses may be mentioned F. R. Pierson, at Scarborough. Mr. Pierson has a modern range of approximately three hundred thousand square feet of glass devoted exclusively to roses. There are few other establishments in the state where the crop so nearly approaches perfection. While a large number of varieties are grown, the principal ones are Ophelia, Mrs. Francis Scott Key, White Killarney, Killarney Brilliant, Lady Hillingdon, and Richmond. Many of the smaller cluster roses, like Cecile Brunner, are also grown in large quantities. Other large-producing establishments in the state are the Lake View Rose Garden, Inc., at Jamestown, and the United States Cut Flower Company, of Elmira.

CARNATIONS

Carnation growing is more generally distributed over the state, but the industry is considerably localized on the eastern section of Long Island. Carnations thrive best in a medium light soil, and in a section where the climate in summer is comparatively cool. These conditions are found on Long Island, and excellent carnations have for many years been produced there. In fact, Long Island was the place where the first carnations were grown in America. The firm of Dailedouze, Zeller & Gard, at Flatbush, which is now the firm of Dailedouze Brothers, was among the first to grow carnations in America. This was in 1858. The firm now has about one hundred thousand square feet of glass and grows some of the finest carnations sent into the New York market. Among other large carnation growers are the Cottage Gardens Company, Queens, and James Cockcroft, Northport, L. I.

ORCHIDS AND SWEET PEAS

Orchid specialists are not numerous in New York State, the New York market being supplied largely from growers located in Northern New Jersey. There are also comparatively few sweet pea specialists.

POTTED PLANTS

Within a comparatively few years there has been a revival of interest in growing potted plants. These were at one time the principal product of glass houses; but, with improved construction and methods of culture, the cut flower business has become more important. A well-grown potted plant is a thing of beauty and admiration, but when poorly grown it is of little value. A few men in New York have seen the value of these plants from the commercial viewpoint and have aimed to produce them to perfection. The demand for potted plants is greatest at Christmas and at Easter, but well-grown flowering plants will sell at almost any season of the year, buyers often preferring a potted plant to cut flowers, because, as a rule, they have better keeping qualities.

The potted flowering plants most generally grown are azaleas, cyclamens, primroses, ericas or heaths, hydrangeas, genistas, calceolarias, cinerarias, begonias, Easter lilies, and other bulbous plants.

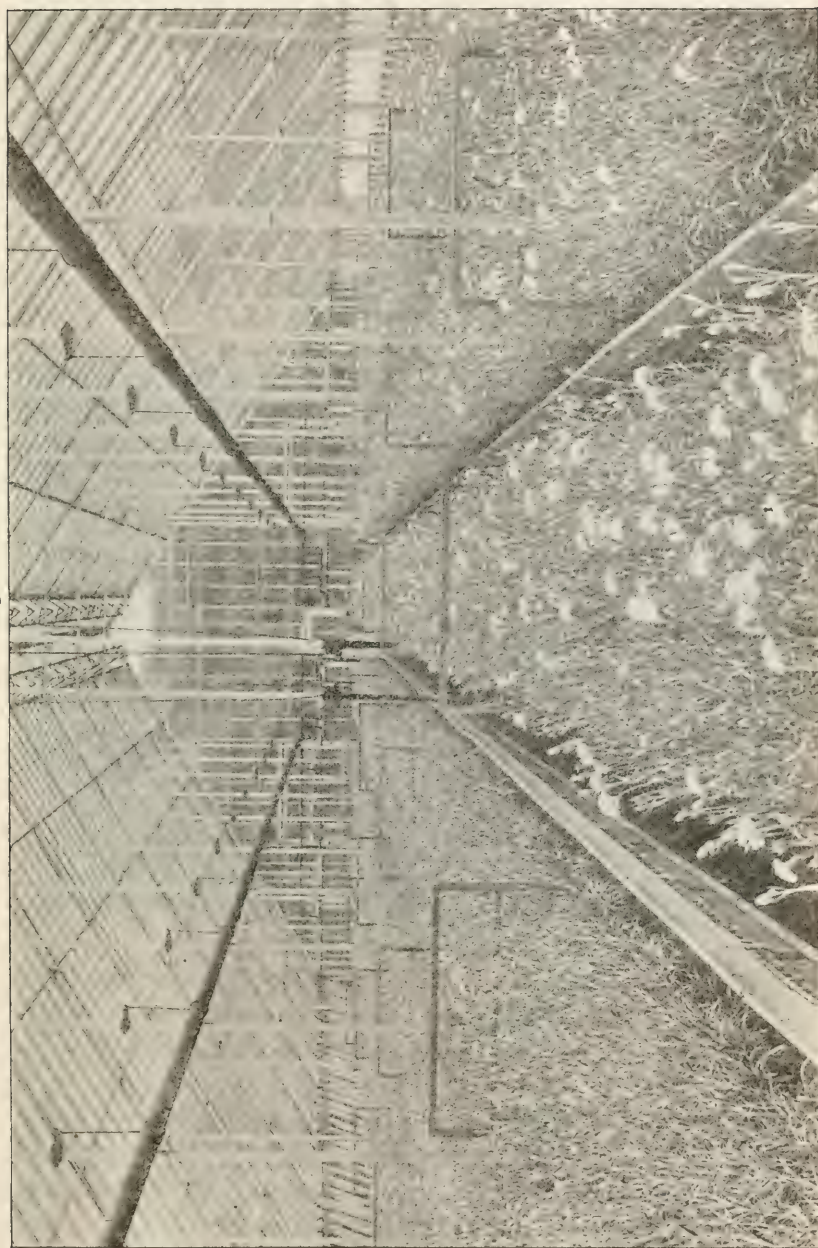


FIG. 562.—“MATCHLESS” CARNATIONS, ORIGINATED BY COTTAGE GARDENS CO., INC.

One of the largest specialists in growing this type of plants is Antoine Schultheis, of College Point, who has approximately sixty thousand square feet of glass area devoted to their production. Mr. Schultheis grows a larger number of ericas than of other species. His range, however, has a splendidly-grown representation of most species of potted plants. Louis Duprey, of White-stone, is another large grower, and his remarkable plants have won many prizes at flower exhibitions.

PALMS AND FERNS

There are no establishments in New York that grow palms and other exotics on a large scale, the New York market being supplied largely by Connecticut, New Jersey, and Pennsylvania. F. R. Pierson of Tarrytown, however, makes a specialty of growing ferns of the *Nephrolepis* type, and his houses are filled with many varieties, from the coarse-fronded "Boston" type to the finely divided "elegantissima." They are in all stages of development, from the newly-formed runner to the splendidly "finished" specimen plant.

BEEKEEPING IN THE EAST

J. H. M. Cook, Caldwell, N. J.

Beekeeping in any particular locality differs from any other locality only as different climatic conditions prevail and cause the bloom to occur at different seasons. The difference is in locality and not in bees.

BEEES READILY ADAPT THEMSELVES TO THEIR ENVIRONMENT

The beekeeper must consider well the environments and natural conditions of his locality and bring his efforts to conform to those conditions, knowing that the bees will faithfully do their part. Bees are most accommodating creatures, and they will adapt themselves to the conditions in which Nature has placed them. They live and thrive wherever honey-producing plants abound. When their lot is cast in this wintry zone, upon the approach of cold weather they cluster in a compact mass, thus conserving the heat generated by the consumption of the honey they have stored, and maintaining living conditions until the advent of spring, when they again pursue their life work of gathering nectar and rearing young bees to replenish the depleting colony.

In the South, where a warm temperature prevails the year around, they pursue their daily round of toil with one instinctive purpose — that of propagating the species. In any locality they can gather stores only during the flowering season and favorable weather.

LIFE HABITS OF BEES SHOULD BE STUDIED

The science of beekeeping consists in a knowledge of the natural laws and life habits of bees, and success depends upon an intelligent application of those laws to our peculiar location and environment.



FIG. 563.—EXAMINING THE BROOD FRAMES — A HOUSETOP COLONY

We must consider the flora and the time of its bloom in our locality and have our colonies of bees in the proper condition to gather the supply of nectar when it is in the flowers.

“We must have our dish right side up when it rains porridge.” This can be done by manipulating our colonies so as to have a large force of working bees ready for work at the proper time. It is as natural for bees to gather stores and produce honey when conditions are favorable as it is for grass to grow or water to run.

As the cow produces milk to feed the growing calf; as the hen lays the egg for the purpose of producing chicks; as trees, plants,

and vegetables mature crops from which their own kind is reproduced, according to natural law; so the bees gather and store honey for its life-sustaining and reproducing results: and, when properly utilized, all these natural products contribute to the happiness of humanity.

The animal and vegetable creation generously respond to man's efforts, and the honey bee will yield a liberal reward for intelligent care and culture. Since the science of bee culture is now so far advanced, our labor in this direction is certain of its reward.

The devotee of rural life and nature studies, when living in the city, will find that a colony of bees in the back yard or on the housetop will add much pleasure and enjoyment and furnish the table with an abundance of Nature's choicest luxury.

We shall gain much practical knowledge of the natural laws and life habits of bees by observing the various changes and developments transpiring in a colony during the year and noting the causes that produce these changes, which are constantly going on during the season of activity.

THE MAKE-UP OF THE COLONY

A colony of bees in normal condition has one mother bee, called the "queen bee," which is the only fully-developed female bee in the colony. She lays all the eggs and is truly a parent, imparting her peculiar characteristics and personality to all the others. She is honored and revered by all, and her loss is the greatest calamity that can befall the realm of the hive. There is nothing that the bees desire more than a queen, and the knowledge of her presence is their greatest inspiration.

There are several thousand abortive female bees, called "worker bees," the number varying with the different seasons. They are all the progeny of the queen. They live a short and strenuous life — longer or shorter in proportion to their activity — averaging from sixty to ninety days. They gather the stores, build the comb, hatch the eggs, and do all the work.

During the summer there are several hundred male bees, called "drones." Their number can be limited by proper management. Their only useful function is to fertilize the young queens, and

at the end of the breeding season they are driven out and destroyed by the workers. They are consumers — not producers — and are never tolerated during a drought or a famine.

WORK AND HABITS OF THE QUEEN

At the approach of spring — in this climate about the middle of March — the queen begins her work of laying eggs; the workers look for the first opening buds on the willows and the maples and bring in the pollen with which to prepare food to nourish the little larvae as soon as hatched. Day by day as warm weather approaches, their activity increases, each day beholding the birth of thousands of little workers ready to buckle on the armor and assume the duties of the old bees, which are now rapidly dying away.



FIG. 564.— QUEEN WORKER DRONE

In a few weeks we have an entirely new population in the hive, the queen being the only one remaining from the previous year. At the opening of fruit bloom and clover, the hive has become so densely crowded that it is quite impractical for the family circle longer to remain in one house, hence what is called the “swarming impulse” pervades the colony. Preparations for this great event are accordingly made, which consists in rearing young queen bees to succeed the old mother, who will leave the hive with the first swarm.

The eggs for the young queens are laid in specially prepared cells, called “queen cells.” When hatched, the larva is fed upon special food called “royal jelly,” and it becomes a fully-developed female bee.

SWARMING

During the process of maturing the young queen and before it emerges from its cell, a large part of the bees, inspired by the

swarming impulse, leave the hive, never to return, and, accompanied by the old queen, depart in a mass to seek another home. This is called "swarming." It is a very peculiar phenomenon in the history of the hive, and is the natural and instinctive method of propagating the species.

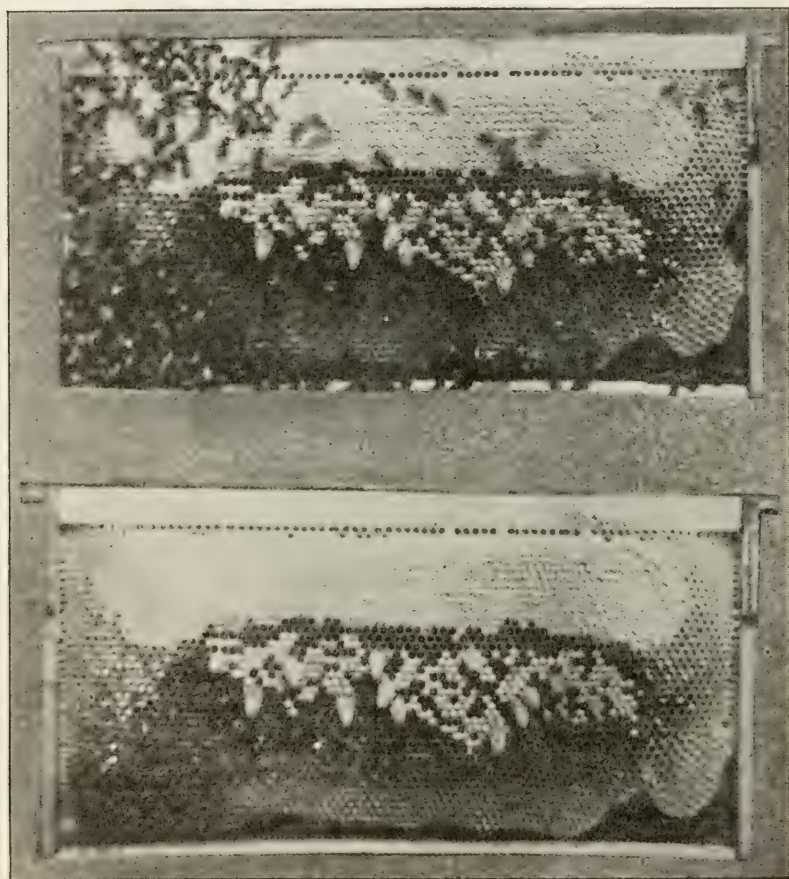


FIG. 565.— BROOD FRAMES, SHOWING QUEEN CELLS

At the proper time, which is a few days before the young queen is ready to emerge from its cell, a great commotion takes place in the hive, and the queen and a large part of the bees rush out in a genuine stampede, as if they were escaping from a danger. Simply for the sake of posterity, they are willing to leave all their accumulated stores of riches that they have worked so hard

to accumulate and protect, and start life anew, trusting to a kind Providence to help them again establish a prosperous home.

The old hive is now depleted of its population to a great extent, but it remains rich in stores of honey and maturing brood, with several rapidly-maturing virgin queens. The oldest one will emerge from its cell in about eight days. As it has a natural animosity for a rival queen, it at once explores every part of the hive and kills the inmates of the other royal cells. However, if the bees of the colony desire to swarm again, they will cluster over the young queens and prevent their destruction, with the result that another swarm issues from the hive, accompanied by the oldest virgin queen. Often, several swarms will issue from the same hive, until the swarming impulse is satisfied.

The first swarm is called a "prime swarm." With it is the old queen, ready to lay eggs as soon as the bees can build combs in which she can deposit them. This gives the prime swarm an advanced start over the later swarms, as they have virgin queens that cannot lay eggs until they are fertilized, which requires about two weeks' time.

When a swarm issues from a hive, the bees will circle in the air a few moments until all are ready, and then set out in a "bee line" for the place previously selected by the scouts, which were sent out a few days previous for the purpose. If, however, the scouts failed to find a suitable place, such as a hollow tree, for example, the swarm will settle on a near-by branch of a tree and remain until a more suitable abode is found. Their first work after they settle in their new abode is cleaning house, and this they do very thoroughly. They will repair and varnish every crevice and make their abode rain-proof. Then their life work of comb-building, brood-rearing, and honey-gathering goes on as usual.

THE CONDITION OF THE OLD COLONY

We shall now observe the disorganized condition of the old colony. The hive which a few days before contained a population of perhaps fifty thousand worker bees, all harmoniously striving for their common good, and increasing its stores of honey several pounds every day, is now nearly depopulated, having only a "home guard" for protection, with a virgin queen that cannot lay eggs in less than two weeks. So far as honey-gathering is concerned, it is "out of business" for several weeks,



FIG. 566.—OUT-APIARY OF W. D. WRIGHT, ALTAMONT, N. Y.

This is the time when the expert tactics of the experienced beekeeper come to the rescue and turn defeat into victory, by preventing the scattering or separating of the working force and persuading the fifty thousand able-bodied working bees to continue on the job and abandon their foolish notion of swarming just then in the busy season. There are methods of controlling the natural impulse of bees to swarm, and also a great difference of opinion

FIG. 567.—HIVE WITH MOVABLE FRAME

among beekeepers as to how this may best be done. One essential condition is plenty of room in the hive, so as to avoid congestion of the brood chamber. To maintain this condition it is necessary to examine the brooding departments at frequent intervals and manipulate them as our experience has proved beneficial.

After the swarming season has passed, bees will continue breeding and gathering stores. But the queen gradually slackens her egg-laying, and at the approach of cold weather she stops laying, while the bees cluster in a compact form and remain so until early spring. These natural developments transpire in a colony of bees every year, and, to be successful, the beekeeper must be familiar with them.

NECESSARY APPLIANCES

The advance in bee culture has given us the hive with movable frame, the honey extractor, and comb foundation. An up-to-date hive should combine three essential characteristics:

1. Brood frames so constructed that they can be easily removed and replaced without injury to the combs or bees.

among beekeepers as to how this may best be done. One

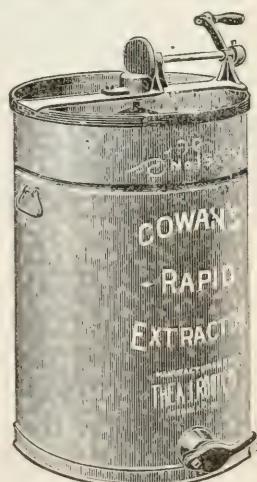


FIG. 568.—MACHINE FOR EXTRACTING HONEY FROM COMB.

2. The hive should be constructed in uniform parts in order that its capacity can be expanded or contracted when required.

3. There should be a "bee space" (an accurate space of three-eighths inch) between all separate compartments of the hive, as this is in accord with the natural law or propensity of bee life. The bees will refrain from building comb in this space, using it only for a passageway.

The honey extractor and comb foundation are two most useful improvements.

The extractor is a centrifugal machine by which we can empty the combs of liquid honey and replace them in the hive to be refilled, thus saving the time, labor, and expense of building new combs.

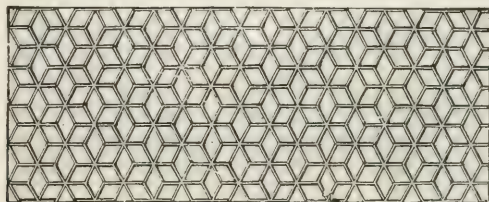


FIG. 569.— BEESWAX PRESSED INTO FOUNDATION FOR HONEYCOMB

Comb foundation is beeswax pressed into sheets with the impression of the base of the cells of honeycomb. Besides being of great assistance to the bees in building comb, it aids in securing the honeycomb in the frames as desired.

BEEF AND VEAL PRODUCTION IN THE EAST

O. C. BOWES

Agricultural Department, Columbia University

Doubtless it seems something of an innovation to attempt to discuss publicly the subject of raising beef cattle in New York State where the industry, once so prosperous, has become almost negative. There have been inquiries from time to time regarding the possibility of raising beef cattle here and those inquiries have been and still remain unanswered because we have no data on which to base any conclusion. I think we can safely say at the

outset that the principal reason for decline of the beef industry east of the Alleghenies has been the use of the refrigerator car and the packing of beef in tin cans to be shipped from the West. Market conditions may change in the future so that the industry may flourish again as previously.

One thing should be mentioned to correct a popular misconception of the history of the beef industry; namely, that as population increases in a region the beef industry must of necessity

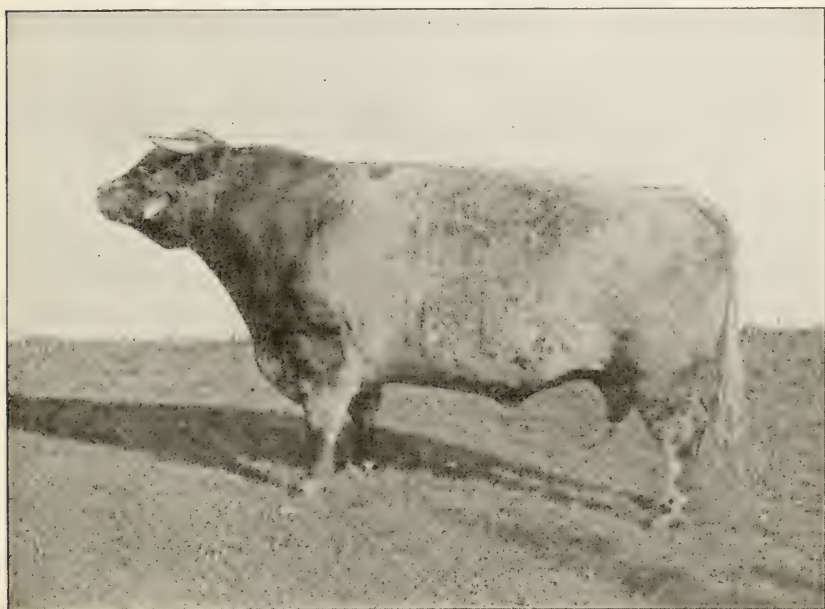


FIG. 570.—THE BEEF TYPE

be abandoned. European statistics show a marked increase in the number of beef cattle raised, in spite of the fact that their methods of farming have become more intensive with each generation.

The experiments with feeding beef cattle in the South show that it can be done with profit; and, with the eradication of the tick, the number of cattle being raised there is increasing. The Alabama Station reports from various feeding trials in 1909 a profit from feeding steers of \$7.71 per steer. The ration used in most

of these trials was cottonseed meal and hulls, silage being added in various amounts. Silage proved more efficient than Johnson-grass hay as a supplement to the basal ration of cottonseed meal and hulls. In the same year, in determining the cost of fattening on pasture by supplementing the pasture with grain feed, they concluded that such a practice was not in that case profitable. They report other trials, however, where fattening on pasture by supplementing with grain did prove to be profitable. They found that providing shelter for the steers did not make any material difference in the rate of gains, and therefore conclude that this expense is not necessary.

Pennsylvania Station reports quite an extensive series of investigations covering a great many years; and, while in some years profits were small, they believe that consistent profits have been made. The large number of cattle fed in some of the sections of the eastern part of the state, particularly in Lancaster County, is indicative of the confidence the farmers there have in cattle breeding. In the western part of the state many beef cattle are raised as well as steers fattened. In Bulletin 138 of the Pennsylvania Station they describe in detail the cost and methods of handling beef-breeding animals. They find the cost of maintaining a beef-breeding cow for a year to be \$34. Heifers at 30 months of age for breeding purposes cost less than their market value as beef. They conclude that beef production can be made profitable under present Pennsylvania conditions where the breeding herd is maintained largely on roughage during the winter and on pasture during the summer, when cattle of insured beef type are raised.

I refer any who may be interested in the details of feeding and management to the bulletins of the stations mentioned above.

FARM MANURES VERSUS COMMERCIAL FERTILIZERS

DR. T. H. EATON

Columbia University

FUNDAMENTAL PRINCIPLES

The addition of materials to the land for the sake of improvement of crop yields is only one of the ways in which man is able to control the growth of plants. It is but a supplement and aid to

the fundamental requisites of fertility in the soil — proper drainage and tillage.

The addition of manurial substances to the land may result in large crops indirectly, as with lime, through the effects upon the soil structure, the life within the soil, or the changes in soil constituents that render plant food available. Or, the increase may be due to the addition of available plant food. Lime is a substance that we add primarily for its indirect effects. Green manures are added for the same reason, or, in the case of legumes, for the sake of increasing the plant-food supply by taking nitrogen from the air. The use of manure and the wastes of the farm in the form of compost constitutes an addition that has in view both the promotion of better physical, biological, and chemical relations in the soil, and the addition of plant foods. The use of commercial food carriers is primarily for the sake of supplying plant food, though the indirect effects should never be lost sight of.

Since favorable physical and biological conditions are prerequisite to any successful use of added plant food, it behooves us to look carefully to the substances that we add with respect to the nature and the effects, both direct and indirect, that science and experience have taught us to expect from them. But it is not enough to study them merely from the point of view of productive increases. We may purchase that increase too dearly. Thus the factor of economy must balance with the factor of utility in the use of manure.

There is no magic in green manures. When we plow rye under, we do not in any way mysteriously increase the supply of food for succeeding crops. By borrowing most cheaply from the air that bulk which tends to the physical betterment of the soil, and by furnishing fodder for the organisms whose activity accelerates the change to more soluble form of the plant food already in the soil, concentrated in the upper layers by turning in the crop, we increase crop yields. By turning under clover, or soy beans, or vetch, or an alfalfa sod, we bring about the same effect and add economically to the supply of nitrogen.

There is no magic, either, by which passing food through the body of an animal gives it value as a manure. From the point of view of fertility, the virtue of feeding live stock lies largely in the

fact that it pays us for those bulkier portions of the food that are derived from the atmosphere, while it saves for us from half to three-quarters or more of the plant food that we desire, and yet leaves sufficient bulk and food for bacteria, along with a seeding for that crop, to make the indirect effects of animal ejecta a marked characteristic of their value.

MAKE-UP AND APPLICATION OF FARM MANURE

Farmyard manure consists of a mixture of the feces, urine, and litter. By the selective process of enzyme action in the body and the necessity for solution in the absorption of food, the more resistant parts of food are left in the feces, and the more available in the urine. The saving of the urine and of the readily decomposable nitrogen compounds in it thus becomes a matter of first-class importance. The value of manure is determined by the food from which it is derived; the care with which it is preserved; the litter that is used; the animal that has used the food; its kind, age, and function; and the way in which the manure is spread.

PERCENTAGE OF PLANT-FOOD CONSTITUENTS IN FRESH ANIMAL EXCREMENTS

KIND OF ANIMAL	EXCREMENT		WATER	NITROGEN	PHOS- PHORIC ACID	POTASH
	<i>Portion</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>
Horse.....	{ Solid.....	80	75	0.55	0.30	0.40
	{ Liquid.....	20	90	1.35	Trace	1.25
	{ Mixed.....	.....	78	0.70	0.25	0.55
Cow.....	{ Solid.....	70	85	0.40	0.20	0.10
	{ Liquid.....	30	92	1.00	Trace	1.35
	{ Mixed.....	.....	86	0.60	0.15	0.45
Pig.....	{ Solid.....	60	80	0.55	0.50	0.40
	{ Liquid.....	40	97	0.40	0.10	0.45
	{ Mixed.....	.....	87	0.50	0.35	0.40
Sheep.....	{ Solid.....	67	60	0.75	0.50	0.45
	{ Liquid.....	33	85	1.35	0.05	2.10
	{ Mixed.....	.....	68	0.95	0.35	1.00
Hen.....	Mixed.....	.....	55	1.00	0.80	0.40

AMOUNTS OF EXCREMENTS PRODUCED FOR 1,000 POUNDS OF LIVE WEIGHT BY FARM ANIMALS IN ONE YEAR

KIND OF ANIMAL	TOTAL EXCREMENTS	SOLID	LIQUID	PER-CENTAGE OF EXCREMENTS IN SOLIDS	PER-CENTAGE OF EXCREMENTS IN LIQUIDS
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>		
Horse.....	18,000	14,400	3,600	80	20
Cow.....	27,000	19,000	8,000	70	30
Pig.....	30,500	18,300	12,200	60	40
Sheep.....	12,500	8,300	4,200	67	33
Hen.....	8,500	.....	.....	.....	.....

RELATIVE VALUE OF PLANT-FOOD CONSTITUENTS IN SOLID AND LIQUID EXCREMENTS

	PERCENTAGE OF NITROGEN VALUE IN		PERCENTAGE OF PHOSPHORUS VALUE IN		PERCENTAGE OF POTASSIUM VALUE IN	
	<i>Solid</i>	<i>Liquid</i>	<i>Solid</i>	<i>Liquid</i>	<i>Solid</i>	<i>Liquid</i>
Horse.....	55	45	100	0	51	49
Cow.....	42	58	100	0	12	88
Pig.....	61	39	86	14	52	48
Sheep.....	45	55	94	6	26	74
Average.....	50	50	93	7	34	66

PLANT-FOOD IN MIXED EXCREMENTS AND BEDDING FOR ONE YEAR PER 1,000 POUNDS OF LIVE WEIGHT

KIND OF ANIMAL	WEIGHT OF MIXED EXCREMENTS	WEIGHT OF BEDDING	WEIGHT OF TOTAL MANURE	NITROGEN	PHOSPHORIC ACID	POTASH	VALUE OF PLANT FOOD IN ONE TON
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	
Horse.....	18,000	6,000	24,000	158	61	145	\$29 60
Cow.....	27,000	3,000	30,000	171	47	148	32 60
Pig.....	30,500	6,000	36,500	180	122	170	36 00
Sheep.....	12,500	7,000	19,500	154	65	175	31 25
Steer.....	15,000	3,000	18,000	135	54	72	21 25
Hen.....	8,500	.....	8,500	85	68	34	18 70

APPROXIMATE VALUE OF PLANT FOOD IN ONE TON OF AVERAGE MANURE

Horse.....	\$2 50
Cow.....	2 20
Pig.....	2 00
Sheep.....	3 20
Steer.....	2 35
Hen.....	4 40

Although, as we may expect, particular samples of manure are very variable, a study in table of the dominant characteristics and estimated values of horse, cow, sheep, hog, and hen manure is worth noting, also the means of preservation as listed.

The difference between the fresh and the rotted manure appears in diagram.

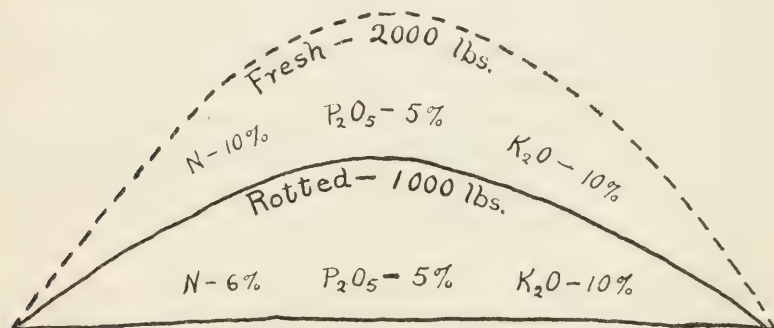


FIG. 571.—DIAGRAM SHOWING DIFFERENCE BETWEEN FRESH AND ROTTED MANURE

(N = nitrogen; P_2O_5 = phosphoric acid; K_2O = potash.)

The figures in the above diagram are based on the manure that is carefully protected; whereas, in more exposed places, there would be an increased loss of nitrogen and a substantial one in mineral matter.

Having in mind the characteristics of the various farm manures, these principles must be observed in any successful method of making manure:

1. Consider the manurial value of your feeds. If two feeds equal in nutritive value are to be had at the same price, buy that which will pay most in the manure heap.
2. Use litter enough to absorb the urine.
3. Use acid phosphate for the preservation of ammonia and the addition of phosphoric acid that manure lacks.
4. Keep the manure heap cool, moist, and compact.

5. Keep it under cover and over a tight floor to prevent leaching. If it must be kept outside, pile in large, compact heaps, so built as to hold the rain that falls upon them.

6. The spreading of manure is largely a matter of labor distribution. Spreading from small heaps is wasteful. Broad-casting from the wagon is better. The manure spreader is superior in economy of labor and distribution.

7. In general farm practice, frequent moderate applications are more profitable than occasional large applications.

8. In general, the sooner manure is applied to the land, the more economical is the result; but the time to spread is when labor can be most economically employed at spreading. Spread when convenient.

AMOUNT OF PLANT FOOD IN STABLE MANURE

	5 TONS	10 TONS	15 TONS	20 TONS
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Nitrogen.....	50	100	150	200
Phosphoric acid.....	25	50	75	100
Potash.....	50	100	150	200

The chief deficiency of farm manure is its unbalanced character. The addition of acid phosphate floats, or, in years of peace, kainit, as a reinforcement is advisable.

COMPOSITION OF COMMERCIAL FERTILIZER

Common fertilizers are mixtures of the common carriers of nitrogen, phosphoric acid, and potash that we have listed. Despite the fertilizer laws, they still remain a great deal of a puzzle to farmers. Even the well-informed farmers cannot tell from the guarantee what the source of nitrogen may be, and, as our listing shows, the availability of the nitrogen in the plant food carrier is, perhaps, the most important thing we can know about it.

COMPOSITION OF SOME FERTILIZING MATERIALS USED AS SOURCES OF NITROGEN, PHOSPHORUS, AND POTASSIUM

Material	POUNDS IN 100			
	Nitrogen	Phosphoric Acid (P_2O_5)		Potash (K_2O)
		Total	Available	
Acid phosphate.....		13 to 18	12 to 16	
Ammonium sulphate.....	20	.....		
Basic slag phosphate.....		10 to 18		
Blood, dried red.....	13 to 15	.....		
Blood, dried black.....	6 to 12	.....		
Bone, ash.....		30 to 35		
“ black.....		25 to 35		
“ black, dissolved.....		13 to 16	12 to 14	
“ dissolved.....	1 to 2	13 to 16	12 to 14	
Bone meal, steamed.....	2 to 3	23 to 25		
“ “ from glue-making.....	1 to 1.5	25 to 30		
“ “ raw.....	3 to 4	21 to 25		
Cottonseed meal.....	7 to 8	2 to 3		1.5 to 2
Fish, dried and ground				
menhaden.....	8 to 10	5.5 to 7		
acidulated.....	5	3		
dog-fish scrap.....	7.5 to 9	3 to 6		
whale scrap.....	11.5	0.8		
Kainit.....				12 to 13
Meat scraps.....	13 to 14			
Muriate of potash (see potassium chloride)				
Nitrate of soda (see sodium nitrate.)				
Nitrate of potash (see potassium nitrate.)				
Phosphates				
Florida hard rock.....		36		
Florida land pebble.....		31		
Peace River pebble.....		28		
South Carolina land.....		27 to 28		
Tennessee blue.....		30		
Tennessee domestic.....		32 to 34.5		
Potassium chloride, 80 to 85%.....				50 to 53
“ “ carbonate, 90 to 95%.....				61 to 64.5
“ “ “ 96 to 98%.....				65 to 66.5
“ nitrate.....	13			44
“ sulphate, 90 to 95%.....				48 to 51
“ double manure salt, 48 to 53%.....				26 to 29
Potassium manure salt, 20%.....				11
Sodium nitrate.....	15 to 16			
Tankage, general range.....	4 to 10	2 to 18		
“ concentrated.....	10 to 12	2 to 4		
“ crushed.....	4 to 9	3 to 18		
“ garbage.....	1 to 2	0.5 to 1		0.5 to 1

COMPARATIVE PLANT FOOD VALUE OF NITROGEN IN ANIMAL AND VEGETABLE
MATERIALS

MATERIAL CONTAINING NITROGEN	AVAILA- BILITY OR CROP- PRODUCING VALUE
Sodium nitrate.....	100
Ammonium sulphate.....	95
Dried blood.....	70
Cottonseed meal.....	70
Castor pomace.....	70
Fish, dried and ground.....	68
Horn-and-hoof meal.....	65
Leather, dissolved with acid.....	65
Leather, steamed.....	15
Leather, roasted.....	10
Leather, raw.....	2

There is, perhaps, not so much saving in money by the home mixing of fertilizer as there once was, but there remains the very great advantage of knowing what you are putting on. And behind that is the educational value of knowing why you are going to put on just what you do. A man can go on for years with purchased brands and know nothing more about fertilizers than the cost per ton and the result, but he cannot mix a solitary batch at home without some consideration of the crop he is to grow and the soil upon which he grows it.

FORM OF PHOSPHORIC ACID

There has been considerable controversy over the merits of rock, bone, and acid phosphate. The chief value of the acid phosphate lies in the superior distribution that you get by solution. Bone phosphate has no particular merit. That derived from rock is as good, and usually much cheaper. The Ohio experiments in the use of rock are very instructive. When a soil is rich in organic matter, so that the bacterial processes are rapid and there is much carbon dioxide in the soil water, a long-season crop may do as well with ground rock as with acid phosphate. But the quantitative comparison is more fair. For comparison in results, the phosphoric acid supplied in rock must be three or four times that supplied in the acid phosphate. Under the conditions named, and where the former is used in the manure heap, the rock may be the cheaper source.*

* See Bulletin 187, Agricultural Experiment Station, Lafayette, Ind.

DOING WITHOUT POTASH

This is a good year to emphasize the dependence of fertility upon a favorable physical condition of the soil. However much we may want potash this year, we cannot buy it. We must draw upon the supply in the soil. By good tillage and selection of crops we may do much to tide over the shortage, and to find out how much we have overestimated the value of applications of potash in most cases. Unfortunately, upon those soils where response from potash has been most marked and profitable, what we can do will count for least. It has been suggested that we use two or three hundred pounds of salt this year for the release of potash from the soil.* Upon clay soils and the heavier loams, this will probably serve effectively; but on such soils, well drained and well tilled, the need for such amendment is not marked. On the lighter soils and the reclaimed swamps it is hardly likely to be effective, and it may establish a precedent that is disastrous. It has taken some time to get away from the practice of using land plaster and salt, and I hope that we shall make no reversion that is permanent. Nevertheless, for the informed man, that is advice worth heeding.

CONCLUSIONS

In summing up, we may say that the heading for this talk is misleading. Manures do not stand against fertilizers. The one is a supplement to the other. The addition of plant food after the establishment of good tilth may be very profitable. Farm manures promote good tilth. We cannot replace good tilth by the most lavish use of plant food. Manuring is a part of, not apart from, good farming.

VEGETABLE GARDENING

PAUL WORK

Superintendent, Department of Vegetable Gardening, Cornell University, Ithaca, N. Y.

One of the most prominent features in the agricultural development of the past fifteen years has been the keen interest that city people have manifested in rural affairs. This interest may be traced to two fundamental reasons:

*Since this was written, experience has indicated slight benefit from the use of salt.

1. The prosperity of the country is fundamental to the prosperity of the city. City people have come to realize this, and are accordingly interested.

2. City people have come to look to the country as a possible field in which to seek a livelihood; and, further, the vast increase in the number of country homes has engendered an interest on the part of their owners in making these estates pay for at least a part of their upkeep.

The interest of city people in agriculture at first showed many of the characteristics of a passing fad. City people were devoting



FIG. 572.—POTATO FIELD OF H. F. HORTON, STEPHENTOWN, RENSSELAER COUNTY, N. Y. FOLIAGE IN PERFECT CONDITION AS A RESULT OF INTELLIGENT FERTILIZATION AND CULTIVATION, FOLLOWED BY THOROUGH AND TIMELY SPRAYING FOR BUGS AND BLIGHT

energy to movements for rural uplift without intimate acquaintance with rural affairs and without actual contact with rural life. Hundreds of city people were ready to plunge blindly into farming in order to make a living, little realizing that agriculture is as complex and difficult as other occupations and that it requires as much of intelligence, energy, and experience as other lines of business. More recently the faddists have dropped out in a perfectly normal way, and "rural uplift" has ceased to be a treatment that might be applied with a brush and has become a cooperation based on mutual intimacy and mutual understanding.

Vegetable gardening has been especially interesting to city

people because its products are especially conspicuous in markets and homes; because the gross returns per acre are relatively high as compared to other lines of farming, and because it offers special opportunities for the exercise of managerial ability and skilled salesmanship.

Many city people have undertaken vegetable gardening in the hope that it could be built into a profitable business. Many have succeeded; larger numbers have failed. Success has been achieved in general by those who have chosen a good location and have planned their operations to fit; who have had a reasonable amount of capital; who have had a real inclination toward plants; who are able to profit by their mistakes; and, finally, who have been able by temperament and equipment to persist in face of serious difficulties in the early years.

Vegetable production falls naturally into three main groups, which may be designated as market gardening, truck farming, and vegetable forcing. No sharp distinctions can be drawn between these, and many farms show characteristics of all three in almost infinite variety of combinations.

MARKET GARDENING

The term "market gardening" is employed in connection with the production of vegetables for local market. This industry is usually found near the cities, where land is valuable and areas are small. It is conducted on an intensive scale at high cost per unit area, but with the expectation of relatively heavy gross returns. Close planting, the growing of more than one crop on the same land in a single season, and the occupancy of the ground by more than one crop at the same time through intercropping or companion cropping are characteristic features. Irrigation is frequently employed and hand labor is more conspicuous than machine work. Fertility is maintained primarily by means of heavy applications of stable manure from the city. The cropping plan includes many different vegetables and specialization has not been developed very far.

This type of vegetable gardening offers opportunity for the grower to meet the special requirements of his own market. No great distance intervenes between him and his trade. This type

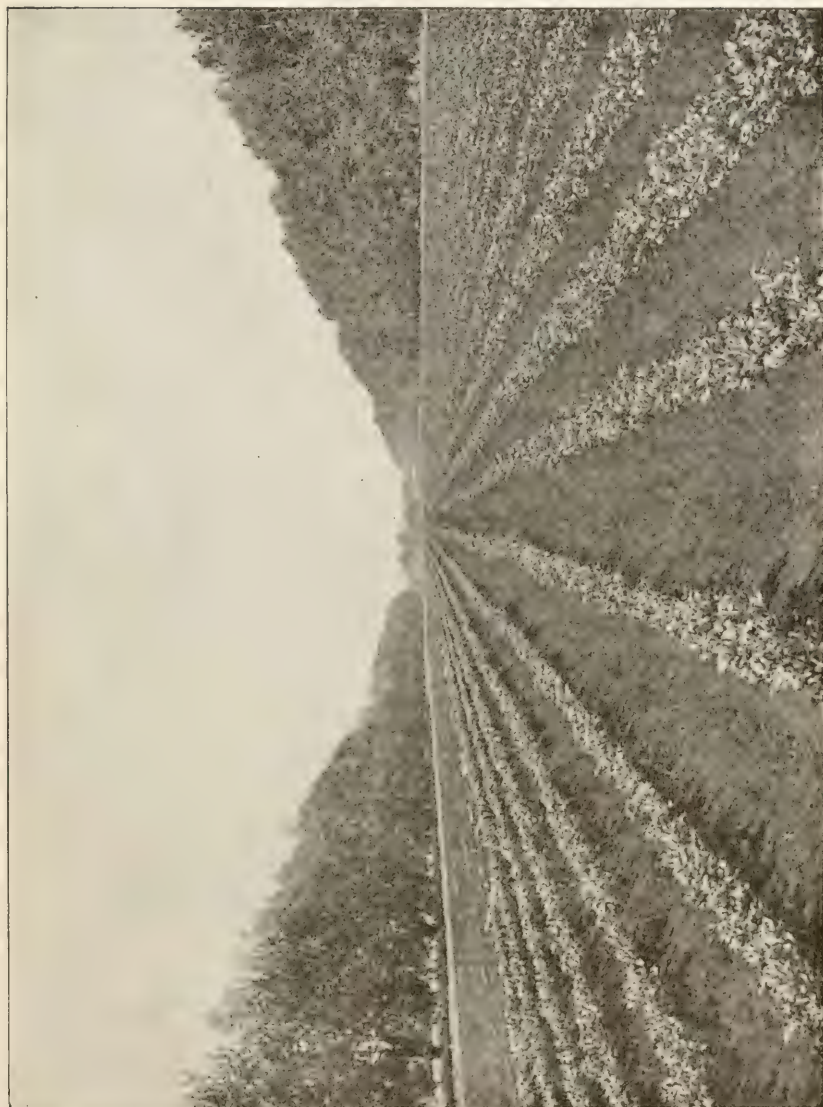


FIG. 573.—CELERY ON MUCK LAND — ALSO SHOWS WINDBREAK

of production offers the advantages of well-distributed labor demand and income throughout most of the year. Many cities are well supplied with market garden vegetables; but numbers, both large and small, offer opportunities for good gardeners. At the same time, market gardening is a highly developed form of agriculture and should hardly be undertaken by one who has not had considerable field experience.

TRUCK FARMING

Truck farming or farm gardening refers to the production of vegetables at a distance from market. The areas are larger, land is less expensive, and the location is chosen on the basis of special adaptation for the production of certain crops. The operations are not ordinarily especially intensive, although there are important exceptions. In other words, the methods bear closer similarity to those of the general farm. Horse and machine labor are conspicuous. The relatively small amounts of manure available are supplemented by commercial fertilizers and manurial crops that may be plowed under. Moisture is controlled rather by conservation than by irrigation. The number of crops grown on a particular farm is small, and the methods are highly specialized.

VEGETABLE FORCING

Vegetable forcing refers to the production of vegetables outside of their normal season by means of artificial heat and protection from cold. It refers to the growing of vegetables in greenhouses, hotbeds, and cold frames. (This subject is treated at length in "Greenhouse Vegetable Production," page 2572.)

ESSENTIALS

Questions are frequently asked in regard to making a start in the business of vegetable production. The elements previously mentioned as making for success cannot be overlooked with impunity.

In choosing a location, the first consideration is a market. One should know something as to its size and demand for vegetable products, the present supply, the means of access, and the selling facilities.

The climatic conditions would come next. The length of the growing season is determined by the last date of killing frost in spring and the earliest date in the fall; the rainfall and the percentage of sunshine are both important.

The land should be as nearly level as possible, and fairly smooth. A slope toward the south or southeast is desirable. In general, the lighter soils are preferred to the heavier soils, and muck lands offer special opportunities for such crops as celery, lettuce, and onions.

Availability of labor, manure, and water should not be overlooked, and inquiry ought by all means to be made as to community, conditions, taxes, and the like. The price paid, of course, determines the fixed annual interest charge.

In general, it is perhaps best to gain possession of a fair-sized area, say not less than 30 or 40 acres, to begin operations in a less extensive way, and let the work become more intensive as experience is gained.

A few main crops well distributed throughout the season, both as regards labor demand and income, ought to be selected and these must be studied very thoroughly and carefully. If one has had little or no experience, he can hardly do better than to work for a good gardener for the first year. He will probably be as well off financially at the end of that time as he would to undertake operations for himself at once, although there are notable exceptions to this.

CONCLUSION

In conclusion, let it be emphasized that fixed rules do not hold, and general statements are likely to be misleading, when applied to individual persons and conditions. Each must work out his own problems independently in the light of the experience of himself and others.

IMPORTANCE AND OUTLOOK OF APPLE AND OTHER ORCHARDING IN NEW YORK AND THE EAST

EDWARD VAN ALSTYNE

New York State Director of Farmers' Institutes

In considering this subject, in order that we may have a correct understanding of the matter, it is necessary that we think straight, or, in other words, be able to draw logical conclusions based on

known facts. I would therefore have you understand at the outset that it is not my purpose to exalt the fruit industry above all others, for to do so would be to set forth an untruth. We must appreciate the fact that one industry cannot for any long period be permanently more profitable than others. The very fact that for a time it is more profitable will cause more people to engage in it, and thus an even balance be maintained.

THE PLACE OF HORTICULTURE IN NEW YORK STATE

Many have the idea that horticultural products are chief among the output of New York farms. This is not true, for the horticultural production is exceeded by vegetables and potatoes, the annual value of which for the last census was \$36,302,150; by cereals, with a value of \$43,099,988; by dairy products, value over \$77,000,000; and by hay and forage, value also over \$77,000,000. Nevertheless, fruit growing in the state of New York has assumed large proportions and has been pursued so long that it is far beyond the experimental stage. There is no state where conditions are more favorable or where the industry is so firmly established. Soil, climate, and proximity to the best markets of the world are most important factors.

The value of all fruit produced in the state of New York, according to the last census, is \$24,826,066. To this may properly be added \$2,750,957 for nursery products. In the latter, New York ranks first. The value of the various fruits are as follows:

Apples	\$13,343,028 00
Peaches and nectarines.....	2,014,088 00
Pears	1,418,218 00
Plums	519,192 00
Cherries	544,508 00
Quinces	135,345 00
Apricots	14,490 00
Total value of orchard fruits.....	\$17,988,894 00
Value of small fruits.....	2,875,495 00
Value of grapes.....	3,961,677 00

The value of all fruits produced in New York State exceeds the value of the tropical and sub-tropical fruits produced in the United States by \$119,313. New York ranks second in bushels of orchard fruits produced, exceeded by California by 645,216 bushels because of her immense prune industry. New York ranks first in the value of apples, first in bushels produced, and second



FRUIT DISTRICTS OF
NEW YORK STATE

FIG. 574.— MAP OF NEW YORK STATE SHOWING FRUIT DISTRICTS

in number of trees. New York ranks third in value of peaches, about equal to Georgia, and less than half the value produced in California. New York ranks fourth in value of prunes and plums, exceeded by the states of California, Oregon, and Washington. New York produces about one-fourth of the quinces raised in the United States. New York ranks second in number, production, and value of grapevines, California ranking first with a production valued at \$10,846,812. New York has 22,496 acres in small fruits, producing 37,857,829 quarts, ranking second and closely following New Jersey, which is first in small fruits. New York ranks first with 11,057 acres of raspberries, and first in currants with 2,557 acres.

HORTICULTURAL SECTIONS

1. The east side of the Hudson, those parts lying nearest the river, beginning with a small section in Westchester County, northern Dutchess, and Columbia. About Germantown in the last-named county, in addition to the tree fruits, there are grown many small fruits and grapes. Tree fruits are grown extensively also in southern Rensselaer County, three to five miles back from the river.

2. West side of the Hudson river, including a small portion of Rockland County, with Orange and Ulster along the river. In the counties in the highlands there is one of the most favorable peach sections in the state. For eleven years there has not been an entire crop failure in either Orange or Ulster County. This section is the seat of a large area devoted to small fruits. In Greene and Albany counties there is much fruit grown, and in both counties there are great possibilities for future development.

3. To the north, the Lake Champlain country — on the Vermont as well as the New York side of the lake. There is also a small section in the Schoharie valley.

4. Central New York, commencing with Onondaga County and extending south and west of Syracuse, also a portion of Cayuga County on the extreme north as well as about the city of Auburn. Seneca, Schuyler, and Yates counties are well adapted to fruit, particularly about the Finger Lakes. This section also embraces



FIG. 575.—PRODUCTIVE PEAR ORCHARD IN COLUMBIA COUNTY

much of Ontario County and extends into northern Livingston and northern Wyoming and Genesee.

5. New York's most favorable fruit section is what is known as the Ontario shore. This embraces Niagara, Orleans, Monroe, and Wayne, with the portion of Oswego County lying nearest the lake. Not only are soil conditions well adapted to fruit growing, but the influence of the lake upon the climate makes it, all things considered, the fruit region of the state, the first four counties producing more fruit than any four states in the Middle West.

GENERAL CONDITIONS

In order that we may get a clear idea of the industry as a whole, I present to you the following figures taken from the last census, which shows a decrease in bearing trees in the United States since the census of 1900 of 23.4 per cent. The 1900 census does not show trees under bearing age. In the last census 23.6 per cent of the farms reported showed 65,792,000 trees not of bearing age, indicating heavy plantings during the decade. If we assume that the 1900 census includes all trees, whether of bearing age or not, we have an increase in the decade of 7.5 per cent.

The Government divides the country into nine different sections. The six where horticulture is of any importance are:

1. East North Central, including Ohio, Indiana, Illinois, Michigan, and Wisconsin. These states show an increase in the decade of 14,000,000 trees.

2. West North Central, including Iowa, Missouri, North and South Dakota, Nebraska, and Kansas. In this section the trees decreased approximately 11,500,000.

3. South Atlantic section, including Delaware, Maryland, District of Columbia, the two Virginias, North and South Carolina, Georgia, and Florida. This section fell off nearly 5,000,000 trees.

4. Middle Atlantic section, made up of three states—New York, New Jersey, and Pennsylvania. Here the bearing trees decreased over 8,000,000—New York about 3,500,000. Much of this was due to the going out of many old trees on account of age and the ravages of the San José scale. Prior to 1900, there was a long period where very few trees were planted. Nevertheless, this division, with a much smaller area, reported nearly as many trees

as that including the Virginias, Maryland, and Delaware and produced more apples than any other division by over twelve millions of bushels. New York produced more than twice as many apples as any state in the Union and 17.3 per cent of the whole.

5. New England states. Every one of these except Maine showed a decrease in the number of trees, the average of which was 9 per cent, Vermont showing a decrease of 16 per cent.

6. Pacific Slope states — Washington, Oregon, and California. These three states combined had about the same number of bear-



FIG. 576.—BALDWIN TREES, 15 YEARS OLD, AND THE PRODUCT OF A SINGLE TREE, IN ORCHARD OF EDWARD VAN ALSTYNE, KINDERHOOK, N. Y.

ing trees as all New England — about two-thirds as many as New York; of those not of bearing age, about four times as many as New England and about the same number more than New York. The product was about equal to that of New England and two-fifths of that of New York.

In the twenty-six states east of the Mississippi there were nearly $31\frac{1}{2}$ millions less trees than in 1900, a decrease of 2.5 per cent. In the twenty-two states west of the Mississippi there was an increase of 27.2 per cent, yet the total number of trees is

greater in the eastern part of the country, separated by the Mississippi, by over 42,000,000, although the planting has been very much larger in the West. In the eastern half, 73.8 per cent are in bearing; in the western half, 63.7 per cent. Canada also is an important factor in the production of apples.

COST OF GROWING AN ORCHARD

In order to get a correct idea of possible profits it is essential that we know the cost of production. This is not always easy to ascertain and conclusions should never be drawn from a single year or from the products of a bearing orchard. One must consider the cost of growing the orchard up to the time of production, which may be anywhere from ten to fifteen years.

The following are the actual expenses of the orchard of Mr. M. C. Burritt, of Monroe County: The orchard is one of apple trees twelve years old, set 36 by 36 feet, with plums and pears set between as fillers. The total cost for the twelve years was \$210.60 per acre, and the gross sales of all crops, \$205.13 per acre, leaving a deficit of \$5.47 per acre after paying all costs, including interest at 5 per cent. This was more than offset by the increased value of the land, now worth \$225 per acre—an increase of \$125 per acre. There was no income from fruit until the seventh year—then only \$41.90 from 7½ acres. The income from this source was slightly less for the next three years. The eleventh year it amounted to \$229.28; the twelfth, \$252.63. The total value of the income from the orchard for the twelve years was \$631.02; to this should be added the income from intercrops of \$907.53. This, subtracted from the cost of the care of the 7½ acres of orchard for the twelve years, which, including 5 per cent interest, amounts to \$1,579.50, leaves a net loss of \$40.95, or \$5.46 per acre. From these figures it will be readily seen that a man without other sources of income would have lost out during this period, as the increase in the value of his property was not an available asset unless he parted with it.

THE COST OF GROWING A BARREL OF APPLES

The above will give a very correct idea of the expense of bringing an orchard into bearing. An exact estimate of growing a barrel of apples on a mature orchard is given below. Some years

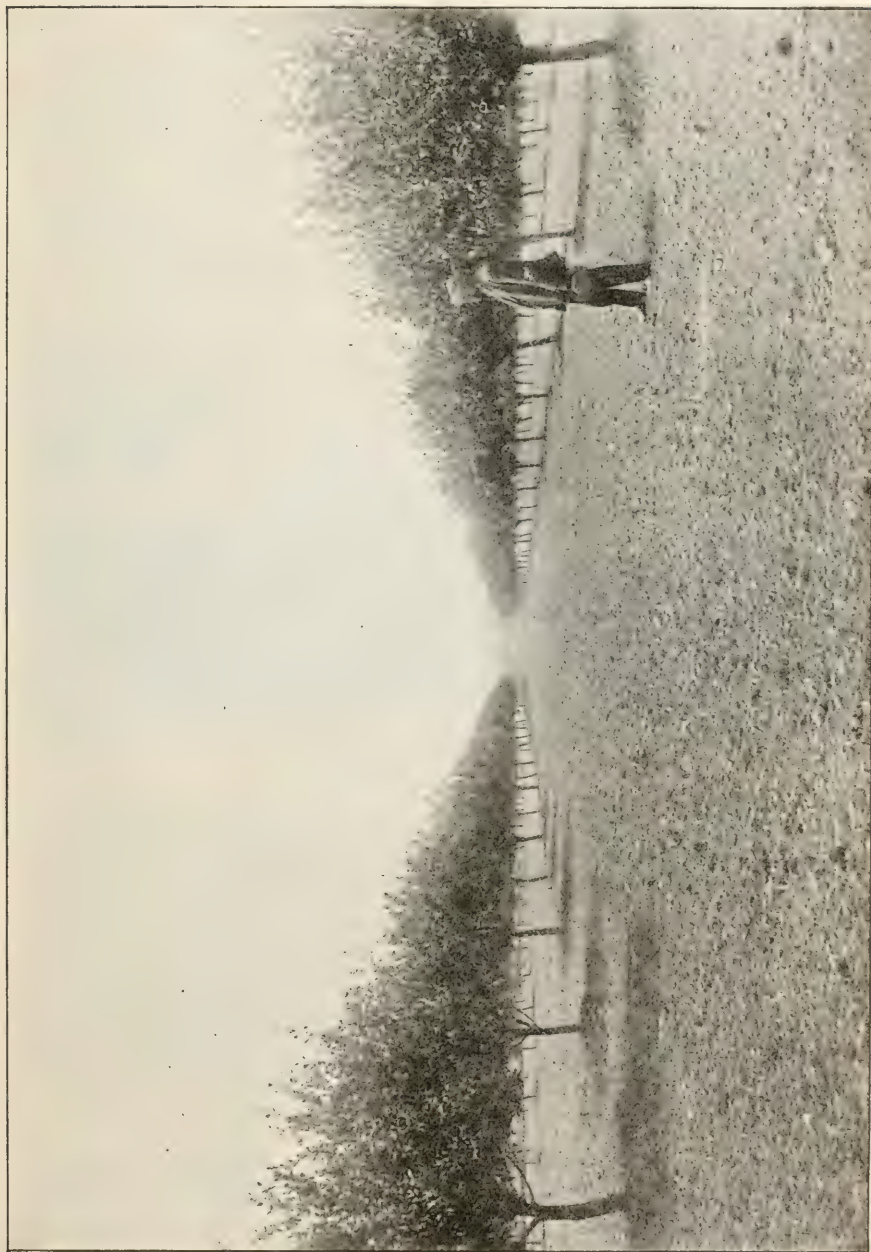


FIG. 577.—WAYNE COUNTY ORCHARD — ALTERNATE R. I. GREENING AND TWENTY-OUNCE IN A ROW

ago the New York Agricultural Experiment Station, in order to determine the advantages or disadvantages of the sod-mulch method compared with tillage, leased a Baldwin orchard of ten acres, the trees being 30 years old. This orchard was in excellent condition and typical of the best orchards of that age in the state.* The total average annual yield per acre was 116.8 barrels. Of this number, 79.2 were barreled stock; the remaining 37.6 barrels were culls. The average price received for the ten years, including package, was \$2.60 per barrel. The interest was figured on an investment of land values at \$500 per acre, for which amount the orchard was actually sold after the completion of the experiment.

The following shows the actual cost of growing a barrel of apples:

	<i>Per barrel</i>
Interest	\$0.21
Taxes	.012
Tillage	.063
Pruning	.03
Spraying	.096
Seed for cover crop	.023
Superintending	.25
Gathering and marketing	.244
Total	\$0.93
Barrel	.36
Total cost of growing and marketing a barrel of merchantable apples	<u>\$1.29</u>

Deducting the cost from the selling price, \$2.60, leaves \$1.31 profit. The seventy-nine barrels brought a profit of \$103.49 per acre. Deducting from this \$7.89, the loss on growing 37.6 barrels of culls over cost of production, we have a net income of \$95.60 per acre—a most excellent business enterprise. One must not, however, lose sight of the fact that, were the selling price reduced to \$2 or below, the income would be materially reduced and orcharding would be no more profitable than many other lines of farm crops.

DEDUCTIONS

There are in the foregoing some factors of decided advantage to the fruit grower, among which are the following:

1. Decreased number of bearing trees.

* Those interested in the details of this experiment will find it in Department of Agriculture Bulletin 79, pp. 803-810.

2. The reduction of both trees and crops, because of insects and diseases. The ravages of both are bound to be greater where orchard plantings are abundant, just as malignant diseases are more prevalent in the densely settled than in the sparsely settled communities.

3. Cold storage, which prevents the crop being put on the market within a short period and extends the time of marketing practically over the whole year. This is very important.

4. Better transportation facilities, which enable the fruit grower to reach distant markets at a minimum of cost.



FIG. 578.—YOUNG ORCHARD, ABOUT TO REACH THE BEARING AGE,
INTERPLANTED WITH BEANS

5. New outlets in regions not hitherto consuming fruit because of their inability to obtain it at reasonable prices and in good condition.

6. The continued increase in population will of course absorb a corresponding increase in production.

7. The better utilization of the by-products in the way of evaporated fruits, jellies, and the like, all are in favor of the grower.

Opposed to this are some disadvantages:

1. The multitude of young trees that will come into bearing in the next decade. The majority of these are in the hands of orchardists rather than the general farmer, hence the trees will receive better care on the part of those who may be termed special-

ists. A larger proportion of young trees than ever before will bear fruit that will be a factor in the market.

2. A more complete knowledge and hence better control of insects and diseases will again swell the product, because of more trees that will bear more and better fruit.

3. The better transportation facilities referred to above make it easier to supply all markets in years of small production in certain sections, thus tending to reduce the price.

4. Another very important factor is the probable increase of labor on the Pacific slope, due to the opening of the Panama Canal. These states have not developed as they might because of lack of workmen. No doubt they decided wisely against Asiatic labor. The major portion of the large number of immigrants that have come to this country in the last half-century have settled east of the Mississippi River. For such to journey across the continent from our eastern seaports meant nearly as large expenditure as to bring them from their homes across the sea. With the opening of the Panama Canal, an immigrant from Southern Europe can reach the Golden Gate at an expenditure of about ten dollars more than it costs to reach the ports of Boston or New York. In view of these facts, and with the climate of the Pacific slope — not dissimilar to that in the native country of the immigrant — there would seem to be little doubt that after the close of the war California and her sister states will absorb an increasing number of the immigrants to this country, thus enabling them to increase their planting as well as their production. An additional fact should not be lost sight of in this connection — that such migration will mean an increased scarcity of labor in the East, in view of which men should carefully consider extending to too great an extent their operations here.

The chief factor in successful orcharding would seem to be a wide distribution of the product. This can only be obtained at a moderate price; for the great consumers of the products of our orchards are not families of great wealth, but those of the artisans, obtaining only a fair wage.

CONCLUSIONS

I would therefore advise medium-sized orchards in connection with mixed farming, as thus the farm can maintain itself and support the occupant in non-bearing years. Labor for the orchard can be had at less cost where it can be employed the entire year or at times when orchard operations cannot be carried on.

This is particularly true as regards that of horses. A careful grower in western New York recently told the writer that when he was growing fruit exclusively his horse labor cost more than thirty cents an hour; combining with it the growing of alfalfa and other farm crops, where the horses could be employed for a longer period, he had reduced the cost per hour to eighteen cents. It is evident that we cannot expect much above two dollars per barrel, including package for apples. A greater price materially reduces consumption.

Realizing and acting on these things it will evidently be wise in moderation for men with apple land to sing with Bryant:

Come, let us plant the apple tree,
Cleave the tough greensward with the spade,
Wide let its hollow bed be made;
Then gently lay the roots, and there
Sift the dark mould with kindly care
And press it round them tenderly,
As round the sleeping infant's feet
We softly fold the cradle sheet,
So plant we the apple tree.

The fruitage of this apple tree
Winds and our flag of stripes and star
Shall bear to coasts that lie afar,
When men shall wonder at the view
And ask in what fair land it grew;
And sojourners beyond the sea
Shall think of childhood's careless day
And long, long hours of summer play
In the shade of the apple tree.

CENTRAL PACKING HOUSES FOR NEW YORK FRUIT

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The enactment of the New York Apple Grading Law has raised a question in the minds of many growers as to whether it might not be desirable to use central packing houses in packing fruit in order to comply with the requirements of the law. With a view to obtaining information that might bear on this question, the writer has collected data as to methods of operation of central packing houses as they exist in the eastern part of the United State and especially in Canada, where apples are packed in barrels under a compulsory apple packing law similar in many respects to the New York law.

It was not thought that all of the methods employed would prove practicable under New York conditions, but it seemed that where there was a great similarity in methods of production and in the kinds of packages used, the same principles should apply in New York State as in the other sections, and that at any rate, since these sections were competitors of New York State, it might be desirable for New York growers to know what their competitors were doing, and planning to do, in the important matter of packing and marketing their crop.

The Canadian apple packing law antedates the New York law by several years, and has now been in operation long enough to produce results. Two very apparent developments have followed the enforcement of this law: First, orchard packing has decreased and a great many central packing houses have been put in operation, and, secondly, the quantity of Canadian apples exported has increased very rapidly in proportion to the total crop. The second development, Canadians believe, is caused to a large extent by the first.

WHY THE CENTRAL PACKING HOUSE CAME INTO BEING

The reason for the establishment of central packing houses was a general dissatisfaction with methods of orchard packing,

and a belief that these methods did not allow due consideration for certain features essential to the successful marketing of fruit. The requisites for successful marketing, Canadian growers believed, were: First, the securing of large quantities of fruit that should be marketed under one brand; secondly, the uniform packing and standardization of this fruit so that each package was as nearly as practicable like every other package of the same grade; and, thirdly, the securing and utilizing of a knowledge of market requirements and conditions.

The methods of orchard packing used in Canada previous to the passage of their "Fruit Marks Act" were similar to those commonly used at the present time in New York State, and an analysis of them certainly shows that they did not permit of the fulfillment of the market fundamentals just mentioned.

By the first of these methods the grower picks and packs his own crop in the orchard, a method that does not bring a large quantity of fruit together for marketing under one brand, even if the grower produced from five to ten thousand barrels of fruit. At the present time, when organizations are putting on the market from 50,000 to 450,000 barrels of fruit under one brand, it will be seen that even ten thousand barrels make a comparatively small impression on a market receiving approximately 2,000,000 barrels of apples a year, as does the New York market.

Neither does this first method fulfill the second requisite — that of uniform packing — for, aside from the variation that is certain to result from barreling an orchard tree by tree, the grower is always a biased judge of the quality of his own fruit, and the crop that he has labored to produce always seems a little better to him than his neighbor's, or one in which he has no personal interest. And thus, because they belong to him, he will often permit apples to go into a better grade than that in which they would be placed if he were grading his neighbor's fruit.

During the operation of the apple-packing train, this point was well illustrated by the testimony of a western New York grower, who stated that he had shipped a car of "orchard-packed" apples to the New York market and followed it to New York in order to supervise its selling. Describing his experience, he said: "When I saw those apples in New York City, if my name had not



FIG. 579.— EXTERIOR VIEW OF CENTRAL PACKING HOUSE SHOWN BELOW

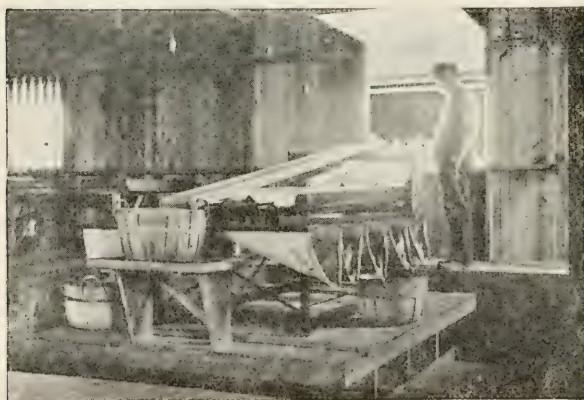


FIG. 580.— INTERIOR OF CENTRAL PACKING HOUSE, WHICH IS EQUIPPED WITH SEVEN MECHANICAL GRADERS DRIVEN BY $2\frac{1}{2}$ -HORSE-POWER GASOLINE ENGINE. CAPACITY, 200 BUSHELS OF PEACHES PER HOUR, PER MACHINE

been on the barrel, I should have sworn that I never had packed them, for they certainly did not look nearly so good to me there as they did in my own orchard."

By a second method in common use, the grower sold his fruit to a dealer or speculator, the grower picking and the dealer packing and paying by the barrel for the various grades that packed out. In this case the dealer had difficulty in satisfactorily supervising packing operations, which went on simultaneously in several orchards, and generally a dispute arose with the grower as to the quality of fruit to be put in the various grades. As it frequently worked out, the buyer's packer would be in "hot water" most of the time trying to follow his employer's instructions, at the same time deferring to the grower's ideas and maintaining friendly relations. Consequently, even if the dealer secured a large quantity of fruit that he marked under one brand, it was very seldom uniformly packed and standardized.

Under the third common method of orchard packing, the grower sold his fruit by the orchard, the dealer doing the picking and the packing, or the grower doing the picking and the dealer doing the packing. Neither of these two methods satisfactorily standardized the pack, because the dealer was now a biased judge of the quality of the fruit. He owned it and naturally wished to pack out as many "A" and "B" grade apples as possible, and was not therefore careful to set a high standard for his grade, nor to maintain that standard during the packing operations.

Since none of the methods of orchard packing fulfilled the requisites for the successful marketing of a large quantity of fruit, uniformly packed, the central packing house came into use. It has not only accomplished its chief functions but also has furnished a method whereby the grower is relieved of the responsibility of supervising unreliable labor during the busy packing season, and has avoided personal interference on the part of grower or buyer in the endeavor to place his fruit in the better grades.

TYPES OF PACKING HOUSES

Two types of packing houses are in use. The one most commonly used in Nova Scotia, where the central packing house idea is extensively developed, is a frost-proof (common) storage with a packing room added.

The storehouse is erected either by a local buyer or by a cooperative company. The type of building is shown in the pictures and diagrams. The warehouse is so arranged that delivery from wagons can be made on one side and shipment by rail on the other.

The apples are hauled to the packing house in barrels, unheaded or loosely headed without grading, except that culls are separated so far as possible in picking.

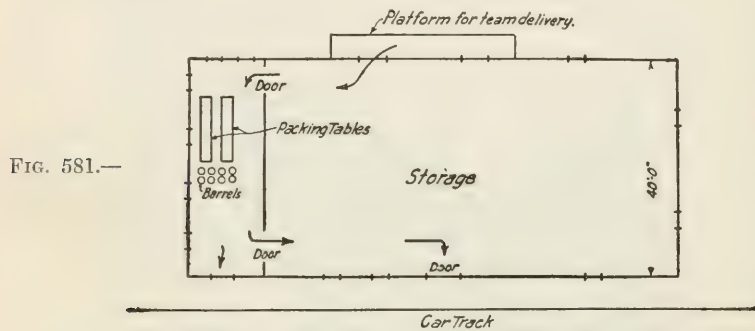


FIG. 581.—

FIG. 581.—USUAL FLOOR PLAN OF PACKING HOUSES. ARROWS SHOW HANDLING OF APPLES IN PACKING. PACKING ROOM GENERALLY PLACED WITH SOUTH OR SOUTHEAST EXPOSURE TO SECURE GREATEST AMOUNT *6 LIGHT

The second type of central packing house is that in which the fruit is packed for immediate shipment to storage or market, as soon as possible after being received, instead of being held at the packing house for any appreciable length of time.

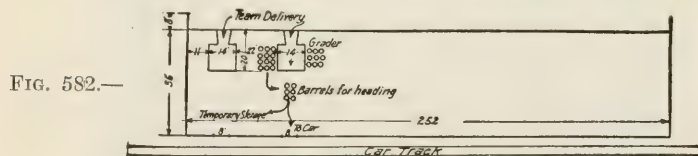


FIG. 582.—

FIG. 582.—ARRANGEMENT OF GRADERS IN PACKING HOUSE WHEN APPLES ARE TO BE IMMEDIATELY PACKED AND SHIPPED. ARROWS SHOW MOVEMENT OF APPLES.

In this manner small quantities of fruit may be packed in cheaply constructed packing sheds without mechanical graders. The accompanying cuts show a type of shed used for this purpose by a Canadian growers' cooperative company, three thousand barrels of fruit being received, packed, and shipped to storage in this shed annually.

Another type of packing house well adapted to the packing of fruit with a mechanical grader is shown in the accompanying cuts and diagrams. The special feature to be observed in its construction is the provision of a clear, bright light over the grader and convenient facilities for delivering the fruit to the grading machine.

The building shown in the cut was used especially for packing peaches, with the details of construction adapted to a peach-grading machine, but these could easily be changed to suit the type of apple grader to be used. Even now, apples are graded to some extent in this house.

METHODS OF HANDLING FRUIT

The apples are hauled on wagons with springs, or on hay racks containing a quantity of straw, to packing houses at various distances up to eight miles, the estimated cost of such hauling being about five cents a barrel for a three-mile haul.

The grower is given a receipt for the number of barrels he delivers. The apples are stored, each barrel bearing the grower's name or number and the variety. Later they are packed, generally just preceding shipment, by a gang of expert packers who have no knowledge of whose apples they are packing. In this manner the fruit of all the growers delivering to the packing house is standardized and bears the same label. After packing, the grower receives a statement from the packing house manager as to the number of barrels and the grades that packed out. In cooperative associations no credit is given for culls. Those found in packing are sold, and the receipts are credited to the general packing expense. The expense of packing is then prorated according to the number of barrels delivered to the central packing house, and not according to the number of barrels that pack out, this arrangement being made in order to minimize the handling of culls and the delivery of slack barrels.

The grading and packing in these houses is generally done without mechanical graders on a padded sorting table, from which the apples are packed into baskets and then put into barrels. The packers generally work in gangs of six or seven men — a foreman, two sorters, a man to face the barrels, one to rack down and head



FIG. 583.—SKYLIGHT DIRECTLY OVER GRADERS



FIG. 584.—NO POSTS TO INTERFERE WITH TEAM
DELIVERY

the barrels, and another to deliver apples to the grading table, take away packed barrels, and place empties. The foreman helps wherever necessary. Such a gang working ten hours a day, it is said, will pack from ninety to one hundred and fifty barrels, depending on the quality, size, and uniformity of the fruit, and the number of varieties on which they work. The cost of packing under this system is given as from nine to seventeen cents per barrel.

An additional charge of from three to ten cents a barrel is made in plants with a storage capacity of 10,000 barrels and upwards in order to cover storage, manager's salary, interest, and repairs on warehouse, and expenses of handling incidental to loading on cars. The managers, however, are sometimes paid by the barrel, or, where cooperative selling is practiced, they receive a percentage of the returns obtained from sales. Such a method of operation as has been described is, of course, especially practicable for cooperative associations of small growers who expect to use only common (not refrigerator) storage and desire to standardize and market their fruit under a common label. In such organizations the common practice is to pool the fruit, sell it, and return to the grower the season's average price on the different varieties and grades.

When large amounts of fruit are to be handled, however, much more rapid grading is necessary, and a mechanical grader must be employed. The type of grader to be used depends on the capacity desired and individual preference for the principle of operation.

Mechanical graders with a capacity of two hundred and fifty to four hundred barrels a day are being operated in houses similar in type at a packing cost of from six to twelve cents per barrel, by using a gang of from eight or ten men.

Those using mechanical graders assert that the most desirable method is to pick into crates in the orchard and haul directly to the packing house, the apples being dumped from the crates on the table of the grader or its conveyor. Each grower is given a receipt on delivery. A small book is kept in the office for each grower, in which each load is entered as it packs out. The cost of packing is apportioned to the number of bushels delivered, and the culls are sold and credited to the general packing expense account.

PRACTICABILITY DEMONSTRATED BY INCREASE

The increasing use of central packing houses in Canada, both by dealers' and farmers' cooperative companies, would seem to prove the practicability of the central packing-house system under a compulsory apply packing law, and should, therefore, prove successful under New York State conditions. The central packing houses makes it possible to pack uniformly a larger quantity of fruit under one label and facilitates marketing by enabling the packer or packing company to acquire a reputation for their brand, and to refill repeat orders from satisfied customers before this brand is forgotten.

In the Annapolis Valley in Nova Scotia, where the central packing-house system is extensively developed, nearly ninety per cent of the fruit grown is packed in central packing houses, either in the packing house of the dealer or that of a cooperative company, the reason for this being that the better and more uniformly packed fruit from these houses will bring better average prices than orchard-packed fruit.

Now that they have secured through the central packing house the uniform grading of a large quantity of apples to be sold under one label, it is interesting to see how the fruit growers of Nova Scotia are attacking the question of selling their product, and the further question of securing and utilizing a knowledge of market conditions, which they believe is the third requisite for successful marketing.

COMBINATION OF PACKING HOUSES

Several years ago, some thirteen of these central packing houses decided to pack the same grades of fruit, pool it, and sell it through a central organization. The following year thirty-three companies followed this plan, and last year there were forty-three subordinate packing houses that marketed their fruit through the central office of what is now known as the United Fruit Companies, Ltd., of Nova Scotia. The central office representing these companies controlled approximately 450,000 barrels of fruit, packed as uniformly as possible by the subordinate packing houses; and, because the company handled so large a quantity of fruit, it was able to accomplish in the way of systematic marketing what separate companies could not have done.

They have representatives abroad and on the Pacific Coast, who in addition to soliciting business, inspect the condition of fruit on arrival and see that it is not misrepresented and that carting charges are not duplicated. They also keep the central office advised as to the condition of the various markets and the quantities of fruit en route to them. If it appears that the Liverpool market, for example, is likely to be oversupplied, the United Fruit Companies route a shipment to London or to Glasgow, Scotland, or time a consignment to arrive at Liverpool about the time that the glut should be cleared up and better prices prevail. By this system the United Companies of Nova Scotia claim to receive better average prices for the season on their fruit than are obtained for fruit of similar quality.

They have also built up a reputation for their brand, so that retailers and distributors in the English markets have expressed a preference for it. The remarkable part of the whole organization is that this entire system of marketing was accomplished at relatively little expense. The average sales expense of a barrel of apples is approximately only four cents, an item that takes the place of the commission charge they previously paid.

It is in this way that these fruit growers are endeavoring to comply with the apple-marketing fundamentals; first, a large quantity of fruit under one brand; secondly, a uniform package, and, thirdly, a utilization of knowledge of market conditions.

PLAN WELL ADAPTED TO NEW YORK STATE

There are ample facilities for the establishing of central packing houses in New York State. A dealer may easily establish such an institution in connection with the warehouse that he uses and insist that all fruit that he purchases must be delivered to him at the packing house and there be packed under his brands. It may be that he will eventually pack fruit that he does not buy, charging a specified price for each barrel, but insisting that fruit so packed shall be packed under his labels, and that he shall receive a commission for selling it.

A second method that will probably come into use will be the formation of packing companies in connection with cold, or common, storage warehouses. These companies will charge a specified

price by the barrel for the packing, and assume the responsibility for complying with the requirements of the New York Apple Grading Law. They will place on the barrel the individual farmer's brand, in addition to the marking required by the Apple Grading Law.

The third method, practicable in New York State, is one that has resulted in the establishment of so many packing houses in Canada and parts of the eastern United States; namely, the formation of cooperative associations among growers. These organizations either erect or rent packing and storage space, employ their



FIG. 585.—PACKING HOUSE OF THE KINDERHOOK FRUIT COMPANY, RECENTLY ERECTED

own manager, pack under an association brand, and sell their fruit through their manager, or through an affiliation of similar organizations.

In New York State, the use of certain packing houses established under any of these methods is certain to result in an improvement of the package over the orchard-packed fruit, and will be the first step that must be taken by growers if they are successfully to meet competition in the apple markets of the world and to obtain prices that will enable them to grow fruit with profit.

FARM ACCOUNTS AND FARM MANAGEMENT

A. J. NICOLL

Farmers' Institute Lecturer

Many centuries ago Xenophen is credited with having said: "Farming is very profitable to the man who understands it, but it brings the greatest trouble and misery to the man who undertakes it without knowledge." This statement will apply to our time as well as to his.

ESSENTIALS TO SUCCESS

The first essential to good farming is a good farm, and the second is a good farmer. In the selection of a farm one should make sure that the soil is fertile and either naturally or artificially drained; that there is a good supply of pure water from never-failing springs or wells; and that the buildings are commodious, comfortable, and attractive.

As a rule, it is much cheaper to buy the buildings with the farm than to erect them after the farm is purchased. It should be situated on a good road and near a good market, a good school, and a good church. Its size should be adapted to the kind of farming to be done and the ability of the farmer as a manager. Other things being equal, larger farms are the more profitable. On a small farm the family must be housed and supported, a team and an equipment of implements and machines must be maintained and housed, while on a larger area of land with small addition to the equipment and some extra help a much larger labor income can be returned to the owner. I do not mean to say that every man who operates a large farm will make a larger labor income than if his farm were smaller; but that if he is capable of managing the larger area he will be handicapped without it. If, on the other hand, he is a man who cannot successfully keep and manage help and who cannot economically produce and market large quantities of produce, he will be far better off with the smaller farm.

Unfortunately, many farmers find themselves in possession of farms that are not just what they would have selected had they been given the opportunity; and but few can sell and locate elsewhere. This is also true of the city man who owns a farm. Some-

times it is the old homestead, or the farm may have come into the hands of the present owner through an investment made when conditions were entirely different than they are now. The problem for each of us is how to manage the farm we have so as to increase not only the profits from the investment but also the fertility of the soil.

BUSINESS MANAGEMENT OF THE FARM AND FARM ACCOUNTS

We sometimes hear the farmer compared to the business man. Why is the farmer not generally recognized as a business man?



FIG. 586.—MUTTON SHEEP, A VALUABLE PRODUCT OF NEW YORK STATE FARMS

He is engaged in the business that was first established on the earth, the business that has the largest investment, the business that is of the greatest importance to the world, and the business of all others that needs the most careful use of the best business methods that are adapted to it. Yet we find few farmers who can tell how much capital they have invested in their business, the net profit or loss on the investment, or the cost of production of any

of the products of the farm. May it not be true that the reason that the farmer is not recognized as a business man is because of his lack of proper business methods?

We wonder at the lack of business methods on the farm; but we must remember that it is not so long ago that there was little need for any system of bookkeeping. If we go back a generation or two in almost any locality, we shall find a time when there was a small investment in the land and very little in buildings, stock, and equipment. Little was sold from the farm for which cash was received and almost nothing came to the farm for which cash was paid. Farm produce was exchanged for what was not produced; if no books were kept, it made little difference to the farm income. We have gradually progressed from that time to the present, when we find ourselves with a large investment in farm buildings, stock, and equipment, on which we are paying high taxes and insurance. We are buying largely the things needed on the farm, for which cash is paid, and selling for cash large quantities of products, obtained at a high cost of material and labor. While this change has been going on, many farmers have failed to adopt the business methods that are considered necessary in any other industry.

Every farmer should have a safe place to keep all valuable papers, and a convenient place for all correspondence. A safety deposit box can be rented in any country bank at small cost, and letter and bill files, which can be bought for twenty-five cents each, make convenient receptacles for business letters and papers.

The farm inventory should be taken at least once a year and as near the same time of the year as possible. The farm inventory consists of a complete list of all real and personal property, including all amounts due, cash on hand, and cash in bank, which added together constitute the resources of the farm. Another list of the debts, which includes all mortgages, notes, and accounts, constitutes the liabilities. The difference between the resources and the liabilities is called the present worth, and is what the farmer would have if his business were closed up at the time the inventory is taken. The inventory shows the farmer the amount of his investment; it gives him a complete list of his personal property, a list of all his bills payable and bills receivable, and tells him what he is worth at the time the inventory is taken. The list of personal

property, which should include all household goods, will be found of great value in adjusting loss in case of fire. Insurance adjusters tell us that in most cases the list of the property destroyed has to be made up entirely from memory.

A careful cash account should be kept by every farmer, and it should be balanced at least once a week. Most farmers keep a cash account, but very few of them balance it at regular times. The following form will show how a cash account can be kept and balanced:

<i>Cash Received</i>		<i>* Cash Paid</i>	
Aug., 1916		Aug., 1916	
1. Cash on hand.....	\$25 00	5. For 10 hundredweight	
1. Cash in bank.....	140 00	bran	\$14 00
2. For one calf.....	12 75	6. For horseshoeing	2 50
6. For 15 pounds butter at		8. Cash on hand.....	23 00
30¢	4 50	8. Cash in bank.....	142 75
	\$182 25		\$182 25

The account is balanced by adding the cash on hand and the cash in the bank at the end of the week to the "cash paid" side of the account.

Every farmer should have a working capital that will enable him to pay cash on all ordinary occasions. By doing this he will be likely to save more than the interest for a year. Records of the cost of production should be kept of all crops grown to be sold from the farm. If animals are kept, records of the cost of all feed consumed, and in the case of dairy cows of the products sold, should be carefully kept and balanced at regular intervals. The milk should be weighed at each milking, and butter-fat tests should be made at least once a month and a careful record kept of all food consumed by the cow. By doing this the owner will be able at the end of the year to cull out all unprofitable animals, and will also have in his records a basis for intelligent feeding and profitable breeding.

THE MANAGEMENT OF THE SOIL

Lawyers tell us that it is a principle of Blackstone that no man owns the soil — that all one owns is the right to use it. No man has a moral right to rob the soil of its fertility. Job recognized this when he defended his integrity before his Maker and said: "If my land cry against me, or if the furrows likewise thereof

complain; if I have eaten the fruits thereof without money, or have caused the owners thereof to lose their life: let thistles grow instead of wheat, and cockle instead of barley.”

Good soil management is producing profitable crops, and at the same time adding fertility to the soil. If the land needs drainage, this should be given first attention. A good system of tile drainage often doubles the yield and improves the quality of the crop. It will lengthen the growing season, raise the temperature of the



FIG. 587.—CLOVER STUBBLE, SHOWING CROWNS AND ROOTS OF PLANTS THAT MAY PRODUCE HUMUS WHEN PLOWED UNDER

soil, admit the air, and encourage a deep growth of roots, thus enabling the plant better to withstand the dry weather. If the farmer can have just enough, and not too much, moisture in his soil, he has one of the main factors in the production of a good crop.

This can often be accomplished by drainage and by deep and thorough tillage. So far as possible, deep tillage at first, followed by more shallow tillage through the growing season, is best. In its virgin state the soil contained a large quantity of decayed organic matter, commonly called humus, which retained the mois-

ture as a sponge holds water and gave it off as the plant needed it. This decayed organic matter also furnished food for the plants.

At present most soils are very deficient in humus. Good soil management not only keeps up the supply of humus in the soil, but increases it, and thus helps to restore the soil to its former condition. This can be done by the use of stable manure and by



FIG. 588.—GREEN-MANURE CROPS SHOULD BE PLOWED UNDER AS SOON AS THEY HAVE ATTAINED THE DESIRED GROWTH. PLOWING SHOULD BE DEEP AND THOROUGH

plowing under crops grown on the land. If the crops that are grown to plow under are of the nitrogen-gathering varieties, such as clover, vetch, or soy beans, the plant food added will be much greater, and if these nitrogen-gathering plants are inoculated by the proper bacteria being applied to the seed or to the soil, their value as soil builders will be still further increased.

By the long-continued growing of plants and by the action of water, the soil has lost some of its original mineral elements.

Good soil management restores these, and we often find that an application of lime insures a crop of clover, where without it the crop would be an entire failure. Good soil management entails frequent and light, rather than heavy, applications of stable manure and supplements it with a careful use of commercial fertilizers. Good soil management also practices a regular rotation of crops and includes in the rotation some of the nitrogen-gathering plants, properly inoculated.

The plowing should be deep and thorough, the furrows being set on their edge rather than turned over flat. A gradual increase of the depth of plowing will in many cases improve the crop. The land should be well fitted for the crop by tillage begun as early as possible after plowing and continued at frequent intervals until the crop is planted. Frequent tillage begun early saves moisture, kills weeds, and pulverizes the soil.

MANAGEMENT OF THE CROPS

The variety of the crop should be adapted to the locality where it is grown and to the market for which it is produced. The areas to be planted should be rectangular rather than square so as to give the longest rows possible, and thus loss of time may be avoided in turning the team.

The seed should be true to name, should as a rule be grown in the locality where it is to be planted, and should always be tested for purity and germination. The germination test can easily be made by the farmer at home and should be attended to before the busy season of planting comes on. A shallow box filled with rich, moist soil may be used for the larger seeds. In testing corn each ear should be tested separately, and only the ears that send strong sprouts from nearly every kernel should be saved for seed. The testing box can be divided into squares for testing individual ears by stretching cords across the top of the box two inches apart. Six kernels should be taken from each ear, each kernel from a separate part of the ear, and deposited in its proper check in the testing box.

At the Iowa Experiment Station, it was found that those ears from which all six kernels gave strong sprouts yielded at the rate of 75 bushels an acre; while the yield from ears that had one

weak and one dead kernel dropped in average to 63 bushels an acre. Seeds of the different grains can be tested in the same way. Each year a great loss is sustained by the farmers of New York State from sowing seed grain of poor germination. A few years ago a dealer in my own locality sold to the farmers 1,600 bushels of seed oats that when sown failed to show a good stand. A germination test showed that 80 per cent of this amount would not grow. A simple test made in time by the farmer before sowing would have saved all of this loss.

The smaller seeds, such as clover and alfalfa, can be easily tested by putting a few pieces of blotting paper into a plate with enough water to moisten the paper and leave a little in the bottom of the plate. Then 100 seeds should be counted out and placed on the blotting paper, and the dish should be covered and set in a warm place. After the seeds have sprouted, the number that have grown will show the percentage of germination. In taking the sample it is well to obtain it from different places in the bag. Purity tests are made free at the New York State Experiment Station at Geneva, New York.

The seed should be planted at the proper depth and distance apart, which should vary according to the difference in soils and varieties of plants. Tillage should be thorough and frequent — deep at first when no root system is in the soil and shallow later to kill weeds, aerate the soil, and save moisture. Harvesting should be done at the proper time and in the most economical manner, considering the cost of labor and the value of the crop.

Marketing can be either by selling the crop for cash or by feeding it to the animals on the farm. To sell well in the market the crop should be of good variety, of good quality, well graded, well packed or prepared for the buyer in an attractive and sanitary manner, and put on the market if possible when the demand for it is good. The name and address of the producer should appear on the package or product. If the market is through the animals, they should be the best individuals of the breed, best adapted to the product to be fed and to the market for the product of the animals. The animals should be well housed in warm, well-lighted, and well-ventilated buildings; supplied with plenty of pure water in a comfortable drinking place; salted regularly;

and kept free from vermin and disease. The product to be marketed through the animals should often be combined with feeds purchased in the market in order to obtain the most profit.

MANAGEMENT OF THE ANIMALS

Animals that are kept on the farm should be of the breed best adapted to the farm and to the market for which their product is intended. They should be good individuals of their breed, since it is much more profitable to have a few good individuals

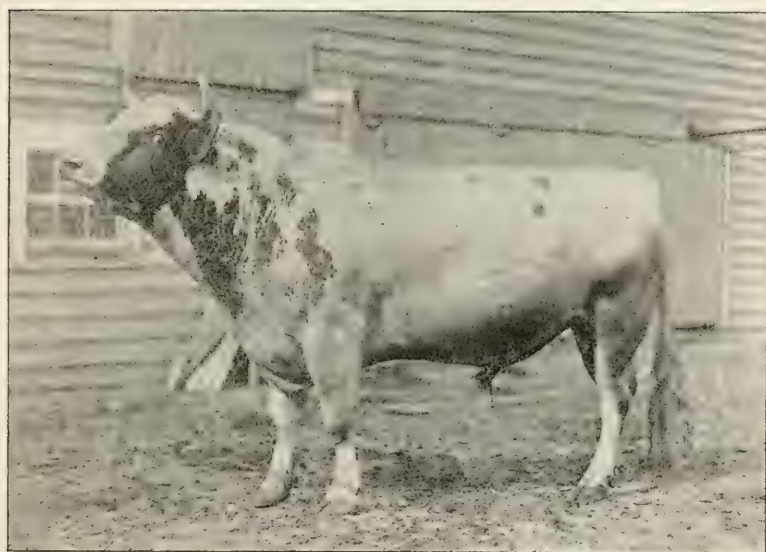


FIG. 589.—AYRSHIRE BULL, A GOOD INDIVIDUAL OF THE BREED

than to have a large herd of average producers. Many farmers could very much increase the production of the herd by better housing, feeding, and care. The farmer who tries to make winter milk in a cold barn and have his cows drink water through a hole in the ice will find it difficult to make a profit. He forgets that the temperature of the barn and the water that the cow drinks must be warmed up by the use of high-priced feeds for fuel.

Careful attention should be given to keeping records of the production and the cost of production of the individual cow. In the case of cows that are pure bred, register-of-merit work should be

done with the breeding associations of the different breeds or through the Bureau of Farmers' Institutes and the dairy improvement associations of the state. Information regarding keeping register-of-merit records under the direction of the Bureau of Farmers' Institutes will be furnished by Edward van Alstyne, Director of Farmers' Institutes, Agricultural Hall, Albany, New York.

The cheapest and best way to increase the production of the herd is by the use of a good sire. The sire should be of the same breed as the cows and a good individual of his breed. He should be the son of a cow that can make more milk and fat than any cow in the herd that he heads.

Other lines of animal industry can often be profitably adopted. In many sections more sheep should be kept. On many farms the number of swine and poultry could be profitably increased.

MANAGEMENT OF THE MACHINERY

Buy no more machinery than is profitable. The interest on the investment and the depreciation on the machine will often pay for doing the work of the machine and sometimes hire a man to run it. If the interest on the money invested in a thrashing machine and the annual depreciation on the machine would pay for the thrashing, it would not be a good investment. Only the very best machines and implements should be purchased, and those of the kind in general use in the locality, as the parts can then be more readily secured. In buying power it is well to buy a little more than one expects to need, since a power loaded to its full capacity is always expensive in fuel and repairs. Unless one is conveniently located near a machine shop, one should have on hand and be able to use the tools and supplies needed for ordinary repairs. When through with a tool, an implement, or a machine, clean it; oil it; and, if it needs any repairs, make them if possible; and put it in its place in the building. Discard an implement or a machine as soon as its use becomes unprofitable on account of wear or of not being adapted to your needs.

MANAGEMENT OF THE FARM HELP

Continuous work for the year can often be provided by a proper combination of crops and stock. If this can be done, a comfortable and convenient home should be provided for the help. With a good house, a good garden, and continuous work at good wages, the man with a family should be much better off on the farm than in the town or in the city. Of course his hours are longer, but he has advantages on the farm both for himself and his family that no town or city can ever give. In hiring, it is well to have the agreement in writing so that no misunderstanding may arise. The farmer should be careful in giving directions for work and in making criticisms; he should pay promptly and regularly; he should do a little more than he agrees to do; and he will thereby receive the better service.

MARKETING—THE PARAMOUNT PROBLEM IN FARMING

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Farmers' Institute Lecturer

There are several phases of the marketing question, each of which should be considered independently, because the methods involved are so different in their application. For this reason, producers should be divided into the following classes:

1. The small producer, situated near a local market, and catering direct to consumer.
2. The larger producer, situated near enough to the market to deal directly with the retailers.
3. The large grower, whose volume of production is so large and whose location is so distant from market as to require his depending on shipment entirely.

DEALING DIRECT WITH CONSUMER

Considering the first, it must be recognized that his business must of necessity be limited, because the details of both production and distribution must be assumed. On the other hand, such a business is often very profitable, because, if properly handled, the entire profits are absorbed by the producer; and, if he deals with the best trade, the prices and consequent profits will far

exceed those that could be realized from the ordinary retail trade. The small grower thus engaged, being in close touch with the consumer, is in position to understand all the whims and caprices of each individual customer, and he should capitalize them by catering to their desires.

One advantage enjoyed by this class of producers that should not be overlooked is the fact that risk is very largely eliminated. The producer is doing business at first hand and should not incur any bad debts; also, he can arrange his planting to meet the demands of his customers, and he is not so badly handicapped by competition, coming sometimes from unexpected sources, as those engaged in the other classes. Success in this class depends on the ability of the grower to produce a high-grade article, while catering to the desires of his customers, working to get the highest class of trade, and exercising courtesy and general good business methods.

DEALING WITH RETAILER

The larger producers, supplying the retail trade, are those that are near enough to market to keep in close touch with retail distributors, but whose business is too great to permit of further distribution. Here, again, it is necessary to study carefully the requirements of each retailer. Every city has many different classes of customers, and it is seldom, especially in our larger markets, that any store has a very wide range of customers. Some retailers, therefore, will require only the very highest grade of products, and others, the ordinary, while there is always a class of trade that can use the poorer grades. Hence, the producer supplying this kind of trade can dispose of all classes of goods, but it requires a close study and understanding of the requirements of his distributors. He is thus relieved of the unpleasantness of dealing with so many individuals and of the large number of small collections, and hence has more time to devote to production and preparation of his products.

DEALING THROUGH SHIPMENT

The third class of producers, who furnish by far the largest proportion of the food products of the country, have entirely different and more difficult problems to solve. Their fields of opera-

tion as producers are much larger, as a rule, sometimes reaching large magnitudes, while their field of distribution often reaches from ocean to ocean — as, for instance, the orange and lemon industry; the great apple and peach industry of our own state, the Virginias, Georgia, Connecticut, Michigan, and the Northwest; the onion industry of southern Texas; the vegetable industry of California, Texas, Florida, Georgia, the Carolinas, Virginia, Maryland, and our own state — the bounds of their distribution

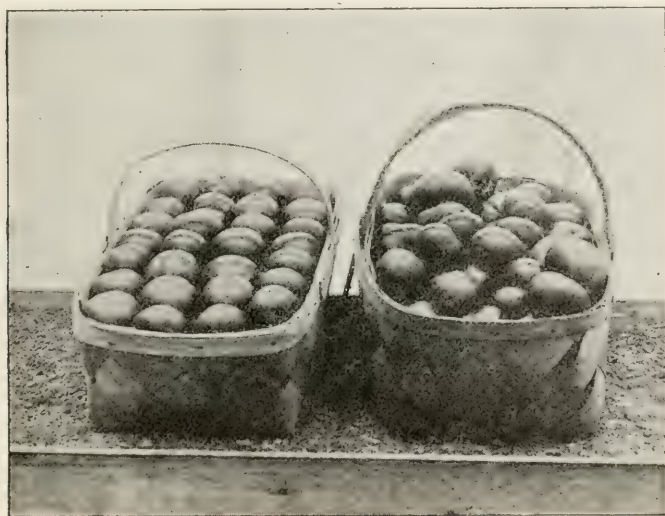


FIG. 590.—A WELL-FINISHED AND A POORLY-FINISHED TOMATO PACKAGE

not being limited even by the bounds of the nation, but extending into Canada, Mexico, West Indies, and even across the Atlantic.

Here they are met with a much larger variety of demands. Not only does the question of grades enter in, but also specific varieties of fruits and vegetables, as well as of butter and eggs; again, the kind of package and manner of packing are sometimes of very great importance. Some will demand nothing but red apples, even showing a strong preference for certain varieties; others will pay equally well for green fruit; and a few markets are not particular. New York City will pay more for red and white onions, while Boston calls for neither, preferring the yellow.

With eggs, the wealthy Jewish people of New York City will pay an extremely high price for the strictly fresh white egg; while, again, Boston wants a strictly fresh, but a genuinely brown egg. Each will pay well to have their caprices satisfied, but neither wants any half-way work. They must be strictly white or strictly brown — no cream-white or light brown eggs will do, and in no case can white and brown ones be mixed without loss in price.

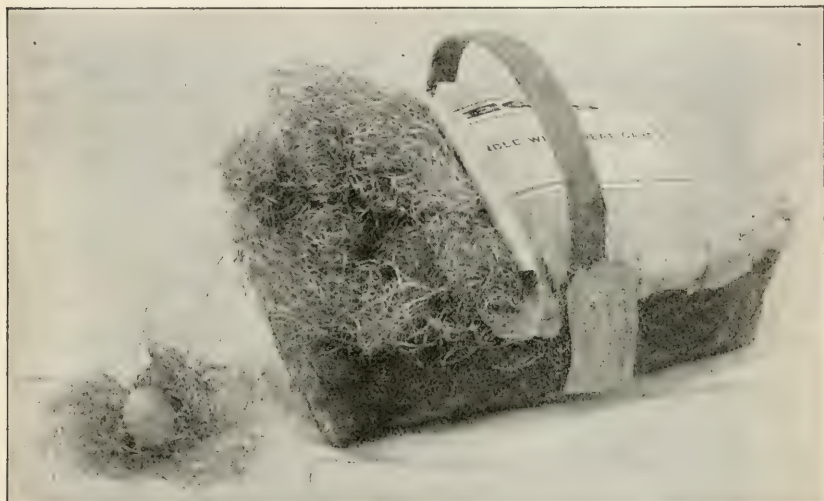


FIG. 591.—EGGS PREPARED TO SHIP BY PARCEL POST

Considering the great diversity of market demands, the vast territory over which the operation of marketing is to be conducted, and the great volume of produce to be handled, the question of marketing the products of this very large class of producers becomes very complex, and it is evident that it is not the job for the novice or the uninitiated. Nor is it the job for the man engaged in the work of production, for that alone, when conducted on a large scale, is a whole man's job.

AGENCIES FOR DISTRIBUTION

We must, then, utilize the present agencies for the wholesale distribution of food products, or, if these are not giving satisfactory results, new agencies must be created. The first of the pres-

ent independent agencies is the local buyer, who is sometimes a shipper but is becoming merely a loader for a general wholesale dealer. The wholesale dealer is usually located at some large central point and makes a business of studying the various market demands, also keeping in close touch with conditions of the various markets as to supply and demand. He, in turn, usually sells direct to a wholesale distributor in the consigning market, sometimes selling direct, but sometimes through still another agency. This additional agency is the produce broker, who acts simply as a go-between, bargaining with the buyer — generally located in his own or in a nearby town — and who usually acts for the seller but occasionally for the buyer. Sometimes the wholesale dealer — or even the local dealer — will consign to a produce commission merchant, who sells it after arrival to the distributing trade, receiving a commission based on the selling price. This commission differs from the fee of the broker, who receives a certain price for each carload, ton, or package, as the case may be.

It can be seen from the consideration of these complex conditions that the grower is rarely justified in undertaking direct selling. It can be further understood that these agencies as just described cannot be expected to interest themselves in furthering the producer's interest, and that only the open competition of these buyers and their consequent eagerness to buy the produce will work to the benefit of the producer.

PRODUCERS' ORGANIZATIONS

If, then, the producer is confronted with lack of interest, possible understandings, or combinations on the part of the local or wholesale buyers, what is the situation? As has been stated, few producers are justified in becoming chandlers, and again it must be realized that a large volume of business is required in order to meet the expense necessarily incurred if the distributing agency is to be made efficient. There seems to be only one alternative — the organization of cooperative business corporations by the producers themselves, thereby pooling their interests in one institution. If this is to be done, several questions must be carefully considered:

1. Is the volume of business that will be handled large enough to justify the undertaking? It may be said that the requirement is not necessarily extremely large on the start, but there should be enough business in prospect so that when the company is once established there will be ample support.

2. It must be understood that loosely organized associations have little chance of success; that a farmers' cooperative association is a purely business corporation, and that if it is to succeed it must be organized with the same care and must be as ably

officered as any other business corporation. No one ever knew a mercantile, manufacturing, or banking company to be promulgated at a large and enthusiastic public gathering, and the directors and officers elected without thought as to their fitness, or whether they would give the business of their company the attention necessary. On the other hand, such institutions are usually the outcome of careful consideration on the part of careful business men as to the need and the probable



FIG. 592.—ATTRACTIVELY PACKED
CELERY READY FOR MARKET

support of the company to be organized, and the fitness of the directors and their willingness to act, and — most important of all, perhaps — a careful consideration of the difficulties to be overcome, together with the chance of failure.

I would not be understood as being pessimistic as to the possibilities, because I am not; on the contrary, I am like many other men who have studied the many successful marketing institutions owned and controlled by farmers — exceedingly optimistic. I would only drive home the fact that these institutions are in essence no different from other corporations. They are no play-

things, nor will they thrive under loan organizations and the associated business methods.

It should be understood that a reputation for fair dealing, together with standardized products sold under brands that always convey to the buyers' minds the same understanding as to the quality of the goods, from day to day, week to week, and year to year, never carrying a false impression, are most valuable assets.

A system of accounting must be introduced, so simple that the most ignorant may understand, but making a full account of every detail of the business. This may seem difficult, but such systems are in operation in many institutions, and a system can be worked out for any company.

CAUSES OF FAILURE

In order to understand how to make them successful, we must study the causes of failure; therefore, in addition to the necessity of thorough business methods, as before mentioned, I wish to call your attention to practices concerning the matter of salesmanship in our large manufacturing companies. Recognizing the fact that if a man is to reach the highest degree of proficiency he must confine himself strictly to certain lines, the producing superintendent or manager pays no attention whatever to the matter of distribution, except to keep himself posted as to the demand; he also keeps his colleague, the sales manager, posted as to the cost of production. These companies also recognize that salesmanship is a special business and that men must have special qualifications to fill such positions. Probably more farmers' corporations, such as creameries, cheese factories, and buying and selling associations, have failed from lack of appreciation of this fact than from any other cause. They have failed to recognize that specific duties devolve upon creamery and cheese factory managers, cheese and butter makers, and buyers and salesmen for cooperative buying associations, and that they must have special qualifications and training; and they have failed to recognize that the cheap man with his limitations is expensive at any price — expensive even if he would work for nothing.

GRADING AND STANDARDIZING

As to standardization, I believe there is only one final solution for grading and standardizing for the average grower, and that is

the public packing house as used in the Citrus Fruit Company, the Northwestern Apple Growers' Association, and the United Fruit Company of Nova Scotia.

It is not possible to educate all producers to understand the grading of products. Several elements enter in: first, lack of understanding of market conditions and therefore no conception of standards required; secondly, the hesitation to put questionable specimens in the grade lower; and, thirdly, and worst of all, dishonesty.



FIG. 593.—FIVE GRADES INTO WHICH THE IONIA GROWERS' ASSOCIATION SORT THEIR CUCUMBERS

A well-constructed packing house, with careful management, with up-to-date appliances, and with a well-educated corps of packers, will grade fruit or other products to standard grades capable of establishing a valuable reputation on the market for less cost outlay than grading and packing can be done by the grower; and, further, the grower can deliver his product as harvested to the packing house and be relieved of all further responsibility, relying on expert graders and expert salesmanship to realize for him the best results the market affords.

THE OUTLOOK FOR FARMERS IN THE EAST

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The subject assigned to me, "The Outlook for Farmers in the East," is intended, as I understand it, to have certain limitations. You have already had presented in this series of lectures, discussions on various types of specialized farming, such as fruit growing, truck farming, greenhouse gardening, specialized milk production, and the like. I take it that I am expected to speak on the outlook for the general farmer in the East.

By "general farmer" we mean the man that expects to get his living from a combination of staple crops and animals. After all, this is the type of farming that, in this country at least, must be regarded as the bulwark of our future success as a nation and as a free and enlightened rural people. Extreme specialization in agriculture, intensive cultivation, and high yields per acre usually presuppose labor conditions that would not be tolerated in America. All these things are found in China and Japan, in parts of India, and in some portions of the tropics. While a high state of manual skill has been attained in these countries, as is evidenced by the quantity of food produced per acre and per man, man himself has been reduced to something just a little above the beasts of the field. Excepting such specialized-crop farmers as we find in the South, where cotton is grown, and in the Northwest, where wheat is produced year after year, nine-tenths of our farming is general farming and should remain so.

Before we can intelligently consider the present outlook for farmers in the East, we must develop a sort of background for conditions as we find them today. Beginning early in the period between 1860 and 1870, there was a very remarkable and unusual development in all the agricultural work of this country. The Civil War brought about results that greatly diminished the supply of labor. There was a remarkable development of agricultural work in the Middle West and North. About this time the Union Pacific Railway was opened, and a little earlier the Homestead Law was passed. The Union Pacific Railway and the great improvement in other transportation facilities, as well as the vast

amount of free land that was offered to settlers, produced profound economic changes in all of our eastern sections. Grain farming was no longer found profitable and gradually moved westward.

Those of us who lived in the Middle West about this period can well recall the almost continuous stream of emigrants passing from east to west. About 1870 to 1875 this great mass of migrants was coming largely from parts of New York State and even further east, and was en route to the cheaper lands of Kansas and Nebraska.

A little later there were some very far-reaching discoveries in the matter of reducing wheat to flour. These were applied in northwestern cities, such as Minneapolis and St. Paul, and led to the development of a new wheat-producing area in all that section and in parts further west. These areas also drew people from the East, resulting in further very marked changes in economic conditions, and the cheapening of lands.

There was at the same time a growing European demand for beef. The range lands of the West were then at their best and furnished opportunities for the production of immense numbers of animals, which could be fattened very cheaply on the grain produced in the Mississippi Valley states. The cheapening of transportation and better facilities for bringing the cattle to eastern seaports had the effect of shifting the production of cattle more and more from the East to the West. The East could not compete in any of these matters, and, further, it could not compete with grain and hay growing as practiced in the West; consequently, it gradually lost the standing that it had previously held in the production of live stock.

These changes proceeded very rapidly during the period from 1880 to 1890. Early in this period the refrigerator car was invented, which brought about another radical change in agricultural work in the East. Up to this time the East had been having more or less of a monopoly in dairy work, especially in the production of butter and cheese. With improved shipping facilities, however, and with the introduction of the refrigerator car, the Middle West immediately became a competitor in this work. With cheap grain and other feeds, and with cheapening transpor-

tation and refrigerator cars, the West could put its products into the eastern markets cheaper than the eastern growers could produce them. All these things had a tendency toward increasing land values in the West and decreasing them in the East.

Some idea of the effect of the influence of improved machinery in all these matters, especially with reference to labor and the production of certain crops, may be obtained when it is known that, whereas thirty-five or forty years ago it took twenty minutes for one man to shuck a bushel of corn and about 102 minutes to take the fodder to the barn and cut it for stock feed, the same work can now be done in 17½ minutes. While it took 160 minutes for a man to shell a bushel of corn, the same work is now done by means of steam shellers in 1½ minutes. It formerly took on an average of 160 minutes to cut, shock, and thresh a bushel of wheat. All this work is now done in less than 4 minutes.

These great improvements in farm machinery enable the average farmer to cultivate much larger areas than he was formerly able to do. This is particularly true in the level country of the Middle West, where conditions are much more favorable for the use of machinery than in the more hilly and rocky regions of the East. The small farms of the East, therefore, were not in a position to compete with the larger farms and richer soils of the West.

Perhaps a more definite understanding of the profound changes that took place in all these matters may be brought out by indicating just what has happened in one of our leading eastern counties in Pennsylvania, which has recently been surveyed by the Department of Agriculture at Washington. This survey and the accompanying study show the very rapid and unusual changes that have taken place in this region, making it necessary almost completely to redirect and reorganize the methods of farming. This is typical of nearly all the eastern sections, including the farming regions of Pennsylvania, New York, and the New England states.

In 1840 there were in this particular county 16,000 dairy cows, 45,000 other cattle, 45,000 swine, and 56,700 sheep. There was produced 438,000 bushels of wheat, something over 9,000 bushels of oats, 86,000 bushels of rye, 826,000 bushels of corn, and 78,000 tons of hay.

From 1840 to 1910 there was quite a rapid increase in the number of dairy cows, from 16,000 to 45,000. The number of other cattle fell off greatly, there being 19,000 in 1910, as compared with 45,000 in 1840. The number of swine also very materially decreased, there being only 21,000 in 1910, as compared with 45,000 in 1840. Sheep grazing largely disappeared, only 5,300 sheep being raised, as compared with 56,000 in 1840. In the matter of the production of wheat, oats, corn, and other crops, the figures of 1910 are not so different from those of 1840. The number of dairy cows in this region is now decreasing. Between the years 1840 and 1860 this was a great butter region. Since that time, however, it has declined in this respect for reasons already pointed out. Farmers in all this eastern region have found themselves under a further handicap in that they were more or less forced to farm on small areas. The farms are too small to give the greatest efficiency in the use of machinery. There was not enough work on these farms to keep the family busy, consequently some of them had to move away or go into other lines of business.

There is evidence now that agriculture is becoming stabilized. This is true, not only in this country, but throughout the world. There is no longer opportunity for the development of conditions that will bring about such violent fluctuations as have been witnessed in the past. The new and available agricultural lands, not only throughout this country, but pretty generally throughout the world, have been taken up, and there is not the pressure for migration that there was formerly. There are still likely to be fluctuations, of course, one way or another, due more or less to local causes, but there will not be the violent swings of the pendulum that have been witnessed in the past. There is still considerable land to the northwest of us that is open for settlement, but our people are beginning to find that there are many handicaps connected with these lands, and there is not apt to be the rush for them in future years that there has been during the past. I am speaking now more particularly about the lands in the Canadian Northwest.

Within the last decade, and especially within the last few years, there has been a rapid rise in land values, particularly in the

Middle West. Only a day or two ago I saw a statement, issued by the United States Department of Agriculture, that land values throughout all this region had increased on an average of \$10 per acre in the last four or five years.

So rapid has been the rise in the value of lands in the Middle West that people can no longer afford to use them for the production of food. These rapid advances in land values are doubtless likely to be more or less temporary. We cannot see how they are to be permanent without very profound changes in our whole plan of agricultural work and its development. As it is now, the high cost of land is forcing a system of agricultural tenantry, which, without safeguards, is most dangerous to our whole agricultural work and to our ideals of rural life. The question very naturally arises as to whether all these matters that we are referring to in their economic bearing, have not a tendency, or will not have a tendency in the near future, to bring about conditions such as exist in many parts of the Old World; namely, a sort of agricultural peasantry — a class of people who must be content to work the land simply because they cannot get into any other vocation, or because they have permitted themselves to become subjected to the results of economic laws over which, as citizens of this great republic, they should have had some control. Any thought of an agricultural peasantry is abhorrent to American ideals. The rapid growth of absentee landlordism, noted in many of our western sections, tends in the direction of the matter that we are discussing. Absentee landlordism makes no plan or well-defined effort to maintain the fertility of the soil.

Encouragement of a system of land-robbing and soil-mining indicates conditions that must be seriously considered in connection with any development of our future agriculture and the solution of any questions in the matter of an outlook toward agriculture not only in the East but elsewhere, for agriculture and farming are no longer localized. Agriculture is nationalized, and any conditions affecting the industry in one part of the country will affect it in other parts of the country.

It is not surprising, therefore, with conditions as we have described them in the Middle West, that people in that and other sections are more and more turning their attention to opportuni-

ties for farming in the East. This is another evidence of the stabilization of agriculture, as we have already pointed out. Farmers are beginning to discover, furthermore, that the promising opportunities advanced for certain types of agriculture are to be taken with considerable limitations. Irrigation agriculture can be practiced only to a limited extent. So far, the work of the irrigation farmer in the West has been difficult, and is likely to become more so rather than the opposite. I am speaking, of course, more especially of the general irrigation farmer, and not the highly trained specialist, such as the orange grower, apple grower, or fruit grower of the Northwest.

It would seem that the best way in which to get a true perspective of the outlook for eastern farming is to endeavor to get a view of some of the basic economic questions involved, and then to note what some of the good farms in the eastern part of the country are producing. There is still an abundance of available agricultural land in the East, and there is considerable of it in New York State. Unquestionably, if the great centers of industry continue to grow, there will be more and more demand for agricultural products. A great many of these products can and should be supplied from nearby sources. There will always be a limited demand for certain types of products, like vegetables, but these need not be considered here. I am referring more especially to the staple things — butter, eggs, market milk, poultry, potatoes, etc.

Before looking toward the undertaking of any farming work along these lines, it must be constantly borne in mind that no fortunes are to be made in farming. A certain amount of independence and a modest competence are about all that can be expected. There is a great deal more in this matter, however, than the mere question of independence and competence. There are the broad and fundamental questions of the relation of agriculture and of life in the open country to the development of our children. I do not believe it is as fully appreciated as it might be that agriculture furnishes the material basis for civilization. This is especially true of educational matters. It is a question whether by any system or method of formal education children confined to city houses, pavements, and city schools can be brought

to their full mental development. There is also less chance that they will develop their full physical vigor under these unnatural conditions. Neither on the intellectual side nor on the physical side does it seem that there is any substitute for direct contact with nature. Life in the open country gives great opportunities, but, of course, we all recognize that there is much to be done toward improvement before full advantage can be taken of the opportunities which Nature has so liberally afforded. A writer has recently said that the actual labor of farming may not have an educational superiority over many other vocations, except for the greater variety and more numerous contacts with nature.

I have spoken briefly of the point that fortunes are not made on farms; in fact, when we come to study the matter critically, we find that the labor income is necessarily quite modest. It is true that with our modern studies of farm management, farm surveys, etc., we have been able to determine pretty accurately what these incomes are. At the same time, we have not yet been able to formulate, blue-print, or project all the things that go along with farm life, so that a mere expression of the labor income of the farm is not to be regarded as by any means representing those intangible things that cannot be expressed in terms of dollars and cents.

We have already referred to the fact that throughout the East our people have been handicapped in the matter of being obliged to farm small areas. Some studies of a very intensive nature have recently been made by the Federal Department of Agriculture, and these bring out some interesting facts in connection with the relation of the size of a farm to the labor income. Other things being equal, the labor income increases with the size of the farm. By "labor income" we mean the surplus after allowing for labor of the family or self on the farm, and after allowing a certain percentage for depreciation, and 5 per cent on the investment. In the surveys made by the Federal Department of Agriculture, a group of sixty-one farms, containing from 41 to 60 acres — an average of 52 acres — had a labor income of \$550. In the next group of sixty farms averaging from 61 to 80 acres, the labor income was \$730. Twenty-five per cent of this group had a labor income of over \$1,000. In the third group, having farms

of from 81 to 100 acres in extent, the average labor income was \$884, and 34 per cent of the farms made over \$1,000. There is a pretty regular ascent in the scale of increase in labor income until we reach the sixth average-sized farm of about 200 acres, where the labor income is \$1,575. This emphasizes the point already made; namely, that, other things about equal, the average family farm having somewhere in the neighborhood of 200 acres is likely to be most profitable.

Now, in respect to profits, let us turn to some of the profits in the East, as shown by some work of the State College of Agriculture. The Department of Farm Management, under Dr. Warren, has consistently taught that farming is a conservative business; therefore, one must expect conservative returns. On an investment of \$9,000 or \$10,000 there might be expected an income of perhaps \$1,000 or \$1,200 above the business expenses of the farm. In addition to this, of course, the family would have the use of the house and some farm products. The houses, however, are not like city houses.

I take it that there may be those present who have been contemplating going into farming in some part of the East. The reading of agricultural literature — at least certain kinds of agriculture literature — is likely to give rise to many erroneous ideas and many mistaken notions regarding farming. There is a great mass of magazine literature and no inconsiderable number of books written on agriculture that are altogether deceptive and misleading.

There are a great many men with business experience, yet lacking in practical knowledge regarding agriculture, who get mistaken ideas as to the possibilities of farming — more especially the possibilities of farming in the East — from the literature in question. They are led to believe that almost any one without previous experience can go on a farm and make it pay from the start. In parts of the West, notably in California, Washington, and Oregon, I have known of successes coming from business men who went into these fields. There, however, the work is very different from farming in the East. The industries are very much specialized. They have more the nature of commercial operations than the natural production of crops. Furthermore, the

methods and practices in these regions are more stabilized. A great deal of the fruit is grown by irrigation, and irrigation farming in an equitable climate is also quite different from general farming in a variable climate, such as in the East.

I would not advise any man with a small capital and no previous actual farm experience, to risk that capital in farming without at least one year — or better two years — of actual work on a farm where operations can be studied at close range, and where actual experience is gained. There is nothing like experience to change one's preconceived ideas regarding a matter of this kind.

To summarize, the outlook for eastern farming is good; better, in fact, than it has been for many years. Conditions are more apt to continue to improve than otherwise, for the reason that agriculture is becoming more stabilized. Our cheap lands have been taken up. The feeling of unrest and wanderlust is dying out. Our people are beginning to look to the land more and more as a heritage to be conserved and used for all time. With the comparatively cheap land in the East, properly managed, properly safeguarded, and properly conserved, there will be as good an opportunity for making farm homes here as anywhere in the country.

If I, myself, were going into farming with a limited capital and with a full consideration of all the issues involved — favorable and healthful climate, opportunities for my children in the way of schools and other things that make for good citizenship, good marketing facilities, the needful associations, surroundings, and social advantages — I believe I could find what I wanted within a hundred miles of Washington, D. C., Baltimore, Md., Philadelphia, Pa., or New York City. My preference for localities would be in the order in which the cities are named, chiefly because in that order, I think, will be found the greater number of those things which make farm life not only profitable but pleasant.

FOLLOW-UP WORK

As the farm bureaus are established in the different counties of the state, the need for follow-up work on the part of the Bureau of Farmers' Institutes ceases. During the past year most of this work was done by Mr. D. P. Witter in the counties of Tioga, Steuben, Ontario, Seneca, Wayne, and Yates, in none of which were there farm bureaus except Tioga, which was organized in January, 1916. Unquestionably, the organization in that county was the result of Mr. Witter's work. That such work is effective is indicated in the following recital of a few of its results:

In the year extending from June, 1915, to June 1916, Mr. Witter made 283 visits at 135 farms in Wayne, Yates, Cattaraugus, Chemung, Lewis, Ontario, Steuben, and Tioga counties. Some of the farms where assistance was most needed were visited on several occasions, and the length of each visit varied from five minutes to four hours. The nature of the advice given differed greatly in different localities.

In Wayne County, which is in the fruit belt, 49 farms were inspected and 122 visits made, and 95 per cent of the information given related to the care of orchards. The remaining requests for aid concerned the laying of tile drain and the improvement of alfalfa, rye, and vetch crops. The great mass of work, however, consisted in orchard improvement. The burden of Mr. Witter's teaching everywhere was the need for thorough spraying. Aphis, scale, and redbug were found about equally, but to a lesser degree apple tent caterpillar, oyster-shell bark louse, or one of the leaf rollers were at the seat of the difficulty. In one instance scale was detected as the source of infestation when the farmer himself had not even known of the existence of such an insect.

A sample report from one farm indicates the work and results:

"September 10, 1915. Some scale on fruit. The spraying, which has been done by hired help, has not been thorough. A promise of better work next year was given. Apples with mildew were taken for information.

"May 5, 1916. Spraying fairly well done. Scale apparently dead. Gave full instructions for destruction of insects of different kinds.

"May 19, 1916. Did not give second spray. Redbug and aphid work found. Advised spray with nicotine added as soon as possible after blossoms off.

"June 23, 1916. Found conditions much improved. Apple orchard in good condition. One or two more sprays will be given under advice."

If the difficulty were not cleared up, or at least improvement made, Mr. Witter found the reason. The following is a typical example:

"September 10, 1915. Tree by roadside source of infestation by scale. Advised that it be cut down and proper spray be applied.

"May 4, 1916. This farmer not thorough enough. Trees well-sprayed from one side only. Urged need of being thorough as best I could."

In many instances, treatment was also advised for fungous diseases, scab predominating and blight canker being plentifully distributed. In one case a new peculiar type of blight was discovered, which was at once submitted to the proper authorities, and which is being watched. Mr. Witter also found it necessary to give considerable attention to pruning, for in nine cases out of ten this work was being done altogether too severely, and in some cases orchards had been permanently injured. In several instances Mr. Witter advocated lowering the sky line with very beneficial results. Cover-cropping in the orchard was also recommended many times, and minute directions were given for the conduct of the work.

As in Wayne County, so in Yates, the chief interests of the farmers were in their orchards. Here 24 farms were visited, and 41 calls were made. In general, conditions reported were similar to those in Wayne County, but a few of the reports sent in lend color to our description of the character of the work. Three of these from three different farms are presented as follows:

"August 11, 1915. This was about the first farm visited when I began this type of work. At that time there was a small pair of

mules for a team, no sprayer, and not much credit. Orchard in poor condition. Now there is a good power sprayer, five good horses, and good crops in general. I found Mr. B. gathering Early Transparent apples, and shipping them to Baltimore. It would be hard to find a greater improvement in general conditions on a place in five years. The general condition was so good that advice was not needed, but the cover crop was discussed. Words cannot tell of the change that has been wrought since this farm was first visited."

"September 9, 1915. Mr. C. said that three years ago everything was covered with scale, and the fruit could not be sold; this year they had not found scale on the fruit or limbs. He said that this was due to the assistance he had received from the state. He is very grateful."

"July 9, 1915. The improvement in this old orchard has been great. Two years ago the trees were too thick, the land was in sod, and no spraying was done. At my request surplus trees were cut out, the land was plowed and well cultivated in summer, with cover crop in late summer and fall, and three good sprayings were given a year. The result has been an entire change in color, appearance, and size of foliage, and annual bearing. To that fact one can attribute the good load of fruit on the trees now, including Baldwins. On young trees aphids was found, and remedy was given."

Instruction in subjects other than orcharding and fruit culture related in a half-dozen instances to the construction of farm buildings, and in a number of others to drainage problems, the rearing of pure-bred stock, the improvement of pasture and grasses, and general farm management.

In Tioga County, 43 farms were visited and 76 visits made. By far the greatest needs in the townships of Tioga County were instructions in pasture improvement and the use of lime and the principles of drainage. In several instances aid was sought in the planting of corn, buckwheat, millet, and in the treating of seed potatoes. Occasionally, orchard and general farming problems were discussed. One special problem was the rearranging of an old cow stable, putting in a concrete floor, and determining the size of the platform. A complete draft of the work was made that proved entirely satisfactory to both proprietor and tenant.

The most conspicuously interesting work conducted in Ontario County was in the township of Phelps, where Mr. Witter makes the following report of his assistance to the Empire State Pickling Company:

"I superintended the cutting of cabbage on experimental plats, looking after all of the field work. A section of about $4\frac{1}{2}$ acres was covered with the experiment. It was eminently satisfactory to the company. The results will be tabulated later and sent in. The final results were not much different from those of last year. But little—in fact, no increase of cabbage was shown from the use of potash, and acid phosphate showed an increase of about fifty per cent. The Empire State Pickling Company said the experiments that I had carried on had been worth thousands of dollars to them."

In the large majority of cases, Mr. Witter's advice was carried out, both in cases where it had been solicited and in those where it had not, with earnest purpose and gratifying results. Occasionally, a farmer was found so poor that he could not do even adequate spraying, for example, but encouragement and interest even in such cases proved productive of surprising improvements.

COOPERATIVE WORK WITH STATE ENTOMOLOGIST E. P. FELT

There have been given in previous years from the institute platform a number of lectures on the work of State Entomologist E. P. Felt in Hudson Valley orchards, advocating one thorough spraying for the control of codling moth. It was apparent to many in the fruit counties along the Ontario shores that these words seemed like "idle tales." While no one questioned the truth of the statement, it was said that conditions must be different in western New York, some even going so far as to suggest that they had a more hardy brood of moth than was found in eastern New York. The matter was of such vital importance that Dr. Felt was asked to undertake a series of experiments in the western New York fruit district similar to those previously conducted in the Hudson Valley. This the doctor willingly undertook, his services being without cost to the Department of Agriculture and the Bureau of Farmers' Institutes, the latter paying the traveling and other expenses incident to the work.

Material assistance was given in Monroe County by Farm Bureau Manager Toan, and in Orleans and Niagara counties by Messrs. Buckholz and Strickland, experts in the Bureau of Plant Industry, Department of Agriculture.

The doctor undertook to work with an open mind with the desire to obtain facts; in addition to what was given on the subject at the normal institute, which may be found on page 2417 of this report, Dr. Felt has furnished the following comprehensive account of his work and his findings:

"SIDE INJURY" AND THE CODLING MOTH

DR. E. P. FELT, Albany, N. Y.

State Entomologist

The control of the codling moth is a problem of great practical importance, to apple and pear growers especially, since investigations have shown that local climatic influences may modify the development of the insect to a marked degree.

Experiments in the Hudson Valley in earlier years gave remarkably satisfactory returns, and in 1915 a series of experiments were planned by the entomologist in cooperation with the Bureaus of Farmers' Institutes and Plant Industry of the State Department of Agriculture and the Monroe County Farm Bureau. The experimental orchards were located in Orleans, Monroe, and Niagara counties, through the courtesy and cooperation of Messrs. J. A. Talbot, of Spencerport; H. E. Wellman, of Kendall; and W. H. Cowper & Son, of Newfane. In each case the men and the equipment on the place were used, the entomologist supervising the operations and being assisted by Messrs. A. B. Buchholz, of Albion, and L. F. Strickland, of Lockport — both agents of the State Department of Agriculture — and by Mr. L. A. Toan, manager of the Monroe County Farm Bureau. As there were twenty experimental trees in each orchard, some bearing as high as eleven barrels, the manual labor involved in the classification of the yield was by no means small.

Investigations during the season showed that in many instances 20 per cent or more of the crop of the western apple section bore the small and characteristic blemish produced by larvae hatching

from late-deposited eggs of the first brood of the codling moth. These minute pests enter the side of the apple, usually during the latter part of June or the first half of July; eat a shallow, circular gallery with a radius of about one-sixteenth of an inch: and then in large measure desert the place of initial injury and migrate to the blossom end, where they frequently succumb to the poison applied just after blossoming. This type of injury is comparable to the early leaf-mining habits of the young caterpillars, and would



FIG. 594.—SIDE INJURY, SHOWING SMALL CIRCULAR SPOTS WITH CENTRAL HOLE, PRODUCED BY YOUNG CATERPILLARS FROM LATE-DEPOSITED EGGS OF THE FIRST BROOD

be of little moment were it not for the permanent disfiguration of the fruit. In many instances a thin slice one-sixteenth of an inch thick or thereabouts will remove the blemish, a mark that disqualifies the fruit for the fancy grade and one that can be admitted into the better grades to only a limited extent. This type of injury is much less common in the Hudson Valley.

The various plots in these tests were sprayed once, twice, and three times, respectively, in each instance unsprayed or check trees

being left for comparison. The first application was made just as the petals were dropping, namely, about May 19; the second approximately three weeks later — June 8 to 10; and the third the latter part of July, at the time the second brood of codling moth larvae are supposed to begin their work. About three pounds of paste arsenate of lead and the usual amounts of lime-sulphur were used in each application.

There were some differences between the various plots, yet all showed material benefit as the result of one spraying and a less evident betterment from the second and third, so far as control of the codling moth was concerned. This was, however, markedly different in the case of fungous infection, which, in the Newfane orchard, was reduced by the first spraying from 88.45 per cent fungous-affected fruit in the check trees to 80.05 per cent in the case of the plot sprayed but once. An additional application, the second, brought the fungous-infected fruit down to 40.04 per cent, while the third treatment reduced it to 23.57 per cent. The benefit from the two later applications, so far as control of fungus is concerned, is so marked that further comment is unnecessary.

There was very little benefit from these three sprayings in regard to checking the leaf roller or green fruit worm; there was a higher percentage of injury by the codling moth in the plot sprayed three times, though this is doubtless explainable by local conditions and is in no way to be construed as militating against repeated applications.

The Kendall orchard, like the one at Newfane, shows a marked benefit in control of fungus from the three applications, the percentages of the infected fruit being 36.45, 12.04, and 11.52 for the plots sprayed once, twice, and three times, respectively, as compared with the checks, which had over half the fruit — 62.82 per cent — infected with fungus. In this series, as in the preceding, there was no marked benefit from these sprayings, so far as control of the green fruit worm was concerned, and apparently none in the case of the codling moth, the percentage of wormy fruit being 27.67, 31.64, and 34.52, respectively, for the plots sprayed once, twice, and three times, as compared with 67.58 per cent for the unsprayed or check trees. This apparent discrepancy is to be explained, however, by the fact that there was a progressive

decrease in the yields of plots 1, 2, and 3, and consequently a percentage comparison is not absolutely fair, since it is well known that a higher percentage of the crop is infested when there is a small yield. This is shown by the fact that in each of these three plots there was a goodly reduction in the number of wormy apples.

The Webster orchard showed, like the preceding, a marked benefit in fungus control from the one, two, and three sprayings, the percentage of infected apples being for these three plots, 46.10, 26.15, and 16.65, respectively, as compared with 74.77 per cent for the check trees. The benefit in the control of the green fruit worm was by no means striking, although there was some reduction in the percentages of wormy fruit, these being 5.20, 3.27, and 3.91 for the plots sprayed once, twice, and three times, respectively, as compared with the checks, which showed an infestation of only 6.36 per cent.

Summarizing the results for the three counties—namely, Niagara, Orleans, and Monroe—the treatments reduced the fungous infection of 75.71 per cent for the check trees, to 49.84, 27.74, and 17.78 per cent, respectively, for the plots sprayed once, twice, and three times. The season, it should be borne in mind, was one of unusual prevalence of fungus. There was in the series, as in the plots, comparatively little benefit from repeated applications, so far as controlling leaf roller or green fruit worm was concerned. The average reduction of wormy apples in the three orchards, resulting from a second spraying for the codling moth, amounted to but 1.29 per cent, and for a third only .6 per cent, or, for the two additional sprayings, a benefit of less than 2 per cent. These figures compare very closely with those obtained during earlier years in the Hudson Valley and strongly confirm previous conclusions relative to the great value, for the control of the codling moth, of the application just after the blossoms drop. These figures are to be interpreted as emphasizing the great value of the first application, namely, the calyx spray, for the control of the codling moth, bringing out very clearly, it seems to us, the difficulty of making up for poor work or neglect by thorough spraying later in the season.

In all fairness it should be added that the results in the Niagara and Orleans County orchards were not entirely satisfactory, so far



FIG. 595.—SIDE WORMY APPLES IN SECTION, SHOWING THE CHARACTERISTIC METHOD OF EATING

as the percentage of wormy apples was concerned, this ranging, for plots in the case of the former, from 13 to 14 per cent, and for the latter from 27 to 34 per cent on the sprayed trees, and on the check or unsprayed trees from 67 to 69 per cent. By far the greater portion of this infestation — 9 to 12 per cent in one case and 25 to 33 per cent in the other — was due to “side injury.” This latter is a peculiar condition that appears to be closely related to evening temperatures, and is a type of injury much more marked in the western part of the state than in the Hudson Valley.

The characteristic mark or blotch produced by the codling moth and termed by us “side injury” is frequently referred to by fruit growers as “side worm” or “second brood” codling moth, though an investigation of conditions has satisfied us that this damage is produced by young caterpillars hatching from late-deposited eggs laid by moths developing from apple worms or larvae that have lived through the winter. This latter is of great practical importance, since it is obvious, if such be the case, that the condition of the fruit, especially in sections where there may be considerable of this side injury, depends to an appreciable extent upon the work of the preceding year. On account of the young larvae, which hatch from eggs deposited upon the fruit, feeding on the comparatively unprotected, growing surface of the apple, the probability of destroying these young apple worms at the outset and before they have inflicted the characteristic blemish, is by no means good. This is borne out by a summary of all the plots, which shows a reduction in side injury of only a little over 1 per cent as a result of the second spraying for the codling moth, and of approximately $\frac{1}{3}$ of 1 per cent additional from the third treatment. There is a possibility that a spraying, given just as many of the young caterpillars that hatch from eggs deposited upon the fruit commence feeding, would be of considerable value in checking side injury, though this is by no means proved.

There are orchards in the western fruit section — and one of the experimental orchards belongs in this class — which are comparatively free from codling moth, the total infestation being approximately 5 per cent or less, and, in the case of the check or

unsprayed trees, amounting to only 6.36 per cent. This comparative freedom occurred in the near vicinity of trees that showed serious codling moth injury in 75 per cent of the apples lying on the ground, indicating that the pest — under certain conditions, at least — will become very abundant. A similar freedom from codling moth injury was also noted in several orchards habitually sprayed but once for this pest. There was this in common for the trees nearly free from codling moth injury: they had been sprayed annually, whether in fruit or not, and it is more than probable that the treatment was thorough. Our conclusions may be briefly summarized as follows:

The first spraying for the codling moth — the treatment just after blossoming — is by far the most effective application for controlling the pest.

The presence of abundant side injury is a most potent argument for thorough annual sprayings for the codling moth, whether the trees be fruiting or not. This may not be necessary where side injury is not serious, as, for example, in the Hudson Valley.

The second spraying for the codling moth would probably be more effective in reducing side injury if it were made the latter part of June or early in July, although, so far as checking this pest is concerned, it does not seem to be essential.

Both the second and third sprayings for the codling moth, even if they have comparatively little influence in reducing the numbers of this pest, are abundantly justified in localities where scab is more or less prevalent, assuming, of course, that a fungicide is universally added to the poisoned spray.

COW-TESTING ASSOCIATIONS

This work is now firmly established in the state, as the following list of 45 associations indicates:

The following list shows the associations under operation, June 30, 1916. During nearly the whole of the past year, however, an additional association — Chaffee-Sardinia, Erie County — has been in operation. On completing the year, June 1, 1916, the association was disorganized and several of the members joined the Java-Chaffee association in Wyoming County.

Again, as previously, Mr. J. A. Ennis spent a portion of the winter at the Alfred School of Agriculture, giving special instruction to dairy students who wish to take up cow-testing work.

As a result of a matter presented at the normal institute (page 2345), Assistant Farm Bureau Director H. E. Babcock was given charge of cow-testing work as it related to farm bureaus, with the result that an entirely new organization has taken place. This is set forth in Bulletin 85, "Dairy Improvement Work in New York State," recently published by the Bureau of Farmers' Institutes, which may be had on request. Because of the existence of this bulletin, less space than usual is devoted to this subject in the present report. Hereafter, these organizations will be known as dairy improvement associations, instead of cow-testing associations. This embraces a wider field of work and also prevents confounding it with testing cows for tuberculosis, as has been done in some instances.

NEW YORK STATE DAIRY IMPROVEMENT ASSOCIATIONS

COUNTY AND ASSOCIATION	DATE BEGAN WORK	PRESIDENT	DAIRY DEMONSTRATION AGENT
BROOME:			
Lisle.....	July 1, 1915	Frank Arnold, Whitney Point.....	Robert Bodin, Killawog.
Susquehanna Valley.....	Nov. 11, 1914	A. B. Griffin, Susquehanna, Pa., R. D. 6.	Earl Love, care of A. B. Griffin
CATTARAUGUS:			
Conewango Valley.....	April 1, 1915	Glenn W. Hall, Dayton.....	Newell J. Brown, Cuba
Ischua Valley.....	April 1, 1912	E. B. Farwell, Ischua.....	Paul L. Green, Hornell.
CHAUTAUQUA:			
Carroll.....	April 1, 1911	F. J. Halliday, Jamestown, R. D. 82.....	Ernest Engdahl, Sinclairville.
CHEMUNG:			
Northern Chemung.....	April 16, 1914	Oscar Kahler, Elmira.....	J. A. Birkland, Care of H. Shriver, R. D. 1, Corning
CHENANGO:			
New Berlin.....	May 1, 1915	G. B. Low, New Berlin.....	Wm. E. Day, New Berlin.
North Chenango.....	Nov. 8, 1915	A. J. Smith, Smyrna.....	Ray Taylor, Smyrna.
West Chenango.....	Mar. 7, 1915	Robert Marshman, Oxford, R. D. 4.....	Glenn Carter, Norwich.
CORTLAND:			
Cortland Co. Central.....	June 17, 1914	Homer H. Jones, Homer, R. D.....	G. A. Burdick, Care of Farm Bureau.
Cortland Co., South.....	June 11, 1914	Richard Phalen, Marathon, R. D. 3.....	Mr. Coke
DELAWARE:			
Cannonsville & Deposit.....	April 1, 1911	Henry Alexander, Kelsey.....	Chauncey Hoag, Deposit.
Delhi-Bovina.....	May 1, 1911	A. J. Nicoll, Delhi.....	James Calhoun, Andes.
Roxbury.....	Nov. 1, 1912	Bruce Mead, Roxbury.....	C. W. Kroneek, Roxbury.
Treadwell.....	April 27, 1916	H. A. Gladstone, Treadwell.....	A. Burton Smith, Treadwell.

DUTCHES: Dutchess County.....	Dec. 1, 1915	Elias Cookingham, Staatsburg.....	James Daley, Arlington.
FRANKLIN: Malone.....	April 10, 1916	John Ferguson, Malone.....	John Wheeler, Malone.
JEFFERSON: Jefferson County, No. 1..... Smithville-Chaumont.	April 17, 1912 May 14, 1913	Fred B. Clark, Carthage, R. D. 3..... G. S. Robbins, Adams, R. D. 4.....	Chas. L. Tift, Lacona. Bert Shannon, Smithville.
LEWIS: Lowville.....	April 20, 1914	Eugene Arthur, Lowville.....	I. C. Gilgore, Lowville.
MONTGOMERY: Montgomery County, No. 1.....	Oct. 1, 1915	Willard Walwrath, Fort Plain.....	Geo. Brainard, Canajoharie.
ONEIDA: Holland Patent..... Oriskany Valley..... Vernon-Verona..... Waterville.....	April 15, 1913 May 3, 1913 Mar. 1, 1914 Dec. 15, 1912	F. H. Thompson, Holland Patent..... John W. Weaver, Clinton, R. D..... Chas. Stellwagon, Verona..... Sinclair Coventry, New Hartford.....	A. C. Anderegg, Holland Patent. Oscar Agne, Verona. Gardner O. Hart, New Hartford.
ORANGE: Blooming Grove..... Minisink Valley.....	July 1, 1915 Dec. 2, 1915	Clarence Gerow, Washingtonville..... E. J. Beemer, Westtown.....	L. J. Cunningham, Washingtonville. Lee Pratt, Westtown.
OTSEGO: Cooperstown..... Otsego No. 1..... Springfield & Cherry Valley.....	Nov. 1, 1914 Dec. 1, 1912 Nov. 9, 1914	Claude Whipple, Cooperstown, R. D. 1..... A. Z. Carleton, Morris..... R. E. Ough, Springfield Center.....	Claude E. Bliss, Cooperstown, R.D. 5. Walter Cornell, West Laurens. Robt. J. Harbison, Cherry Valley.
ST. LAWRENCE: Gouverneur..... Stockholm.....	April 6, 1916 April 11, 1914	Earl Laidlaw, Gouverneur..... V. H. Ballou, Winthrop.....	C. M. Bane, High School, Gouverneur. Raymond Potter, Farm Bureau, Canton.

NEW YORK STATE DAIRY IMPROVEMENT ASSOCIATIONS—*Concluded*

COUNTY AND ASSOCIATION	DATE BEGAN WORK	PRESIDENT	DAIRY DEMONSTRATION AGENT
SCHOHARIE Lawyersville.....	July 1, 1915	Marvin Bellinger, Seward.....	Le Ray Brown, Cobleskill.
STEBEN: Cohocton Valley.....	Feb. 18, 1916	Lee Shults, Avoca, R. D.....	John R. Allen, Bath.
SULLIVAN: Liberty.....	Dec. 5, 1915	Wm. R. Crary, Liberty.....	Arthur A. Booth, Liberty.
TIOGA: First Tioga.....	Jan. 1, 1916	L. H. Leonard, Owego.....	Jas. H. Ball, Newark Valley.
TOMPKINS: Ithaca (Cornell).....	May 1, 1908	Department of Dairy Industry, Cornell University.....	Wayne Dingman, Ithaca, R. D. 1.
ULSTER: Walkill.....	Dec. 1, 1914	Fred Du Bois, New Paltz.....	Wm. J. Wilcox Amity.
WASHINGTON: Cambridge Valley..... Hartford-Hebron.....	June —, 1916 April 24, 1913	Geo. E. McGeoch, Cambridge..... E. B. Norton, Hartford.....	W. W. Jackson, Cambridge. Kendrick E. Chase, Hartford.
WYOMING: Attica..... Java-Chaffee..... Perry-Pike..... Warsaw..... Wethersfield.....	Nov. 1, 1914 July 1, 1914 June 1, 1913 July 14, 1914 June 22, 1915	C. H. Waite, Attica..... A. E. Nichols, Java..... John L. Fuller, Castile..... H. W. Avery, Warsaw..... Louis J. Zeches.....	R. Daggett, Attica. Scott Warren, Johnsonburg. Chas. T. Hunt, Pike. Milo Davis, Warsaw. Harold B. Stout, Bliss.

NOTE.—The foregoing list includes several associations that have not yet reorganized and are still working under the old plan of the cow-testing association.

The following is an extract from an article printed in a recent copy of the "Montgomery County Farm Bureau News":

SUCCESSFUL COW-TESTING ASSOCIATION WORK

GEORGE BRAINARD, Canajoharie, N. Y.

With the cow-testing association on a sound working basis, the results are becoming more and more apparent each month. These results are visible, not theoretical or imaginary. I will endeavor to cite several instances to show that the work has in a measure been successful.

1. A short time ago a dairyman wished to dispose of a calf. He was about to make way with one, when it occurred to him that he would see what the dam had been doing. In looking over her record, he saw that the dam was a good cow, paying him a fair profit each month. Consequently, another calf, whose dam's record was not so good, was disposed of instead. Were it not for an association record on his herd, he would not have known which was the better calf to keep.

2. Another man, in looking over his cow-testing record, decided that some five or six of his cows were a poor business proposition. He at once began investigating to find why these cows were not paying. In the majority of instances, the cows' teeth were found to be almost entirely gone; one cow was nearly dry, with no signs of freshening this season. The result was that they were sold and other stock were put in their places.

3. Late in the spring, when some farmers were beginning to look over the silage and hay on hand, one man decided he could not get all his herd through the season in the stable and give them the usual ration. As he therefore figured that four cows must go, he sold the four poorest—those which from the time of freshening had netted him little or nothing for the feed they consumed and the labor he had put on them. How did he know which were his four poorest cows? He simply referred to his record book, and a few minutes' study told the story.

4. A herd which had about a six months' association record on it was recently sold at auction. One of the prospective buyers hesitated to purchase without knowing the cows' records at the

pail. He secured the records of the cows, which gave him the desired information, and when he bid these animals in he did not feel as if a long chance had been taken. This instance shows where an association record helped in the sale of cattle. The owner had the figures, and they tell a story better than any words the auctioneer or seller can give.

In cases where other men have been interested in the feeding proposition, the association record has told them to feed less grain where a cow had not been paying for her keep and to increase where a cow could make profitable use of the feed.

One man who did not feed to advantage was asked why he did not feed more grain; the answer was, "At the present price of milk, the increase in flow would only cover the cost of the extra feed." Perhaps he was correct; but did he figure that if he did only break even on the extra cost of grain, his cows would be in enough better condition to have fully warranted the extra expenditure, not to mention the pleasure of at least handling the extra money?

Several men have weighed the feeds for individual cows and have admitted that the cows gained where they fed for production. A saving was made in feed, and a saving in feed is a saving in money. Would these men have known which cows they were keeping at a loss and which at a profit, were it not for the association record? Perhaps they would, but cows are very deceiving in their milk supply during the season, and the association records often prove a surprise and a help to those who have them.

EXHIBIT AT STATE FAIR

For the third time a booth was maintained at the State Fair, located as in the previous year in the west wing of the Liberal Arts Building. As the horticultural exhibit was in the main part of this building, many more farmers were brought in contact with the exhibit than a year ago. As in previous years, much literature was distributed and many names taken for information on a variety of subjects, and more or less of a continuous farmers' institute was held.

The director's assistant, Mr. W. F. McDonough, was in charge, assisted by three of the institute workers — Messrs. Witter, Van Wagenen, and McPherson. Owing to sickness in his family, the director was unable to be present.

The cow-testing associations were represented on the opposite side of the aisle by Messrs. Nicoll and Ennis.

FARM BUREAUS

The close relations with the farm bureaus has been maintained. In every county but one maintaining a farm bureau, the institute conferences have been held under the auspices of the farm bureau manager. The managers have been very helpful, not only in assisting to locate institutes, but in indicating the subjects that shall be considered, and in awakening an interest and assisting at the meetings. The various county projects have had a conspicuous place on the program, and the managers have done much to give the institute workers the true local viewpoint.

As related in connection with cow-testing associations, the cooperation of the farm bureaus has made possible the advance work along this line. Five new bureaus have been organized during the year.

The complete list is given below:

ORGANIZED FARM BUREAUS IN NEW YORK STATE, JULY 1, 1916

M. C. Burritt, State Director, Ithaca.

H. E. Babcock, Asst. State Director, Ithaca.

<i>County</i>	<i>Manager</i>	<i>Headquarters</i>
Albany	H. E. Crouch.....	Court House, Albany.
Allegany	F. C. Smith.....	Belmont.
Broome	J. F. Eastman.....	Chamber of Commerce, Binghamton.
Cattaraugus ...	H. K. Crofoot.....	Olean.
Cayuga	J. R. Teall.....	Auburn.
Chautauqua ...	H. B. Rogers.....	Chautauqua.
Chemung	M. E. Chubbuck....	Chamber of Commerce, Elmira.
Chenango	E. P. Smith.....	Norwich.
Clinton	C. B. Tillson.....	Plattsburgh.
Cortland	E. H. Forristall....	Cortland.
Delaware	E. R. Eastman.....	Walton
Dutchess	F. H. Lacy.....	Poughkeepsie.
Erie	W. L. Markham....	Chamber of Commerce, Buffalo.
Essex	J. H. Phillips.....	Essex.
Franklin	C. M. Austin.....	Malone.
Herkimer	C. A. Taylor.....	Herkimer.
Jefferson	F. E. Robertson....	Watertown.

<i>County</i>	<i>Manager</i>	<i>Headquarters</i>
Monroe	L. A. Toan	Chamber of Commerce, Rochester.
Montgomery . . .	A. S. Merchant	Canajoharie.
Nassau	T. M. Avery	Mineola.
Niagara	N. R. Peet	Lockport.
Oneida	O. F. Ross	Chamber of Commerce, Utica.
Onondaga	S. A. Martin	112 Court House, Syracuse.
Orange	T. E. Milliman	Middletown.
Oswego	E. V. Underwood . . .	Oswego.
Otsego	F. S. Barlow	Cooperstown.
St. Lawrence . .	C. S. Phelps	Canton.
Saratoga	A. M. Hollister	Saratoga Springs.
Schoharie	R. F. Pollard	Cobleskill.
Sullivan	J. A. Richardson . . .	Liberty.
Tioga	E. R. Zimmer	Owego.
Tompkins	V. B. Blatchley	Ithaca.
Ulster	W. H. Hook	Kingston.
Warren	E. W. Cleaves	Warrensburg.
Westchester . .	J. G. Curtis	Chamber of Commerce, White Plains.
Wyoming	H. M. Bowen	Warsaw.

NEW WORK IN CONJUNCTION WITH H. E. CROUCH, MANAGER OF
ALBANY FARM BUREAU

Naturally, the relation between the Albany Farm Bureau and the Bureau of Farmers' Institutes is very close. As may be noted in the following table, Mr. William Hotaling spent six days in Albany County in demonstration work in orchards.

DEMONSTRATION WORK IN ORCHARDS

<i>Place</i>	<i>Date</i>	<i>Sessions</i>	<i>Attendance</i>
Bethlehem Center	April 5, 1916	1	8
Coeymans	April 7, 1916	1	12
Dormansville	April 12, 1916	1	26
Dunnsville	April 13, 1916	1	16
Guilderland	April 6, 1916	1	8
Indian Fields	April 12, 1916	1	14
Latham Corners	April 6, 1916	1	8
Ravena	April 7, 1916	1	8
South Bethlehem	April 5, 1916	1	25
Verdoy	April 10, 1916	1	15
Totals		10	140

An entirely new line of work was taken up in Albany and Greene counties. Instead of the demonstration train, which has

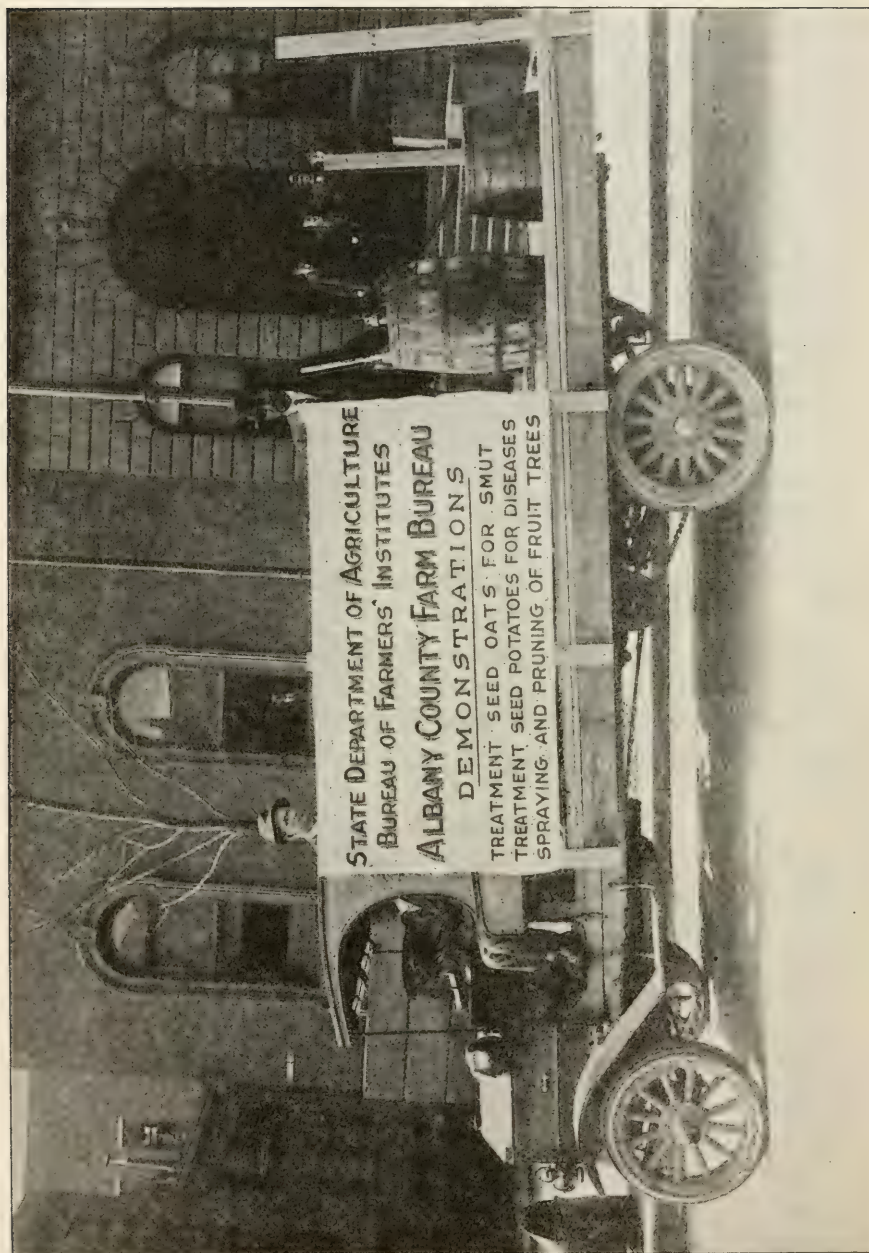


Fig. 596.—AUTO DEMONSTRATION TRUCK ABOUT TO LEAVE AGRICULTURAL HALL.

been much in evidence, an auto truck was used. This was furnished with a barrel spray pump, a tub for soaking seed potatoes with formalin solution for scab, a platform on which oats could be treated for smut, and a full set of pruning tools. The work was in charge of Messrs. Hotaling and Crouch. The purpose was to reach small places, more or less remote, which had not had agricultural meetings. Owing to the bad condition of the roads, the trip was delayed, and most farmers were afield. Nevertheless, at every place, representative men were present and gladly availed themselves of the information given. Several who came out of curiosity expressed their appreciation of the practicability of the work. Two hamlets were visited each day, four days being spent in Albany County and two in Greene County. The list of places and record of attendance is given below:

DEMONSTRATIONS WITH AUTO TRUCK

<i>Place</i>	<i>Date</i>	<i>Attendance</i>
Albany:		
Berne	May 2, 1916	14
Chesterville	May 3, 1916	8
Guilderland Center	May 1, 1916	8
Knox	May 1, 1916	12
New Salem	May 2, 1916	8
Preston Hollow	May 4, 1916	18
Rensselaerville	May 3, 1916	8
South Westerlo	May 4, 1916	30
Greene:		
East Durham	May 5, 1916	12
Greenville Center	May 6, 1916	30
New Baltimore	May 6, 1916	33
Oak Hill	May 5, 1916	25
Total		206

COUNTY CONFERENCES

These have become so thoroughly established that their purpose is understood and they are looked for by the people. For two reasons, this year's work is deserving of special mention: First, most of the traveling was done by automobile instead of by train, thus making it possible to visit two counties each day, and making a valuable saving of time to the director. This method also affords an opportunity to observe the farming and agricultural conditions in the different counties, and the first-hand knowledge thus obtained enables the director to serve the people more effectively than ever before.

In June, 1915, the eastern and northern portions of the state were visited; the following August, the middle and western portions. In June, 1916, the entire state was gone over, except the northern portion, which will be visited in August. By this change in time, opportunity has been afforded for the study of conditions both at seed-time and harvest.

The second notable point was the participation in these conferences by Professor D. J. Crosby, who is in charge of the extension work at Cornell University. So mutually satisfactory was this cooperation in August, 1915, that this year the joint work extended over every county in the state. The call for conferences was signed by both the director of farmers' institutes and Professor Crosby, and it stated that both farmers' institutes and extension schools would be located at the conference.

The plan is a most excellent one. The moral effect is fine, showing that both these agencies for agricultural advancement are working in unison. Time is saved on the part of those attending. With a limited number of both institutes and schools, more equitable and mutually satisfactory assignments can be made than would be possible in any other way. People are given to understand that they cannot have an institute and a school at the same place in the same year. Frequently, one will serve a community

better than the other. The conference usually brings out this fact, and thus a satisfactory arrangement is made.

Never have the conferences been so well attended. People are learning that the interest manifested by a personal attendance — often at a sacrifice of valuable time — goes a long way to secure them a meeting, and the personal interchange of facts does much to make the meetings what they should be. This year Chautauqua County bears the banner for interest and attendance, there being thirty-six persons present, who asked for twice as many days as the number assigned and for seven more meetings. Four places voluntarily withdrew their applications; to these institutes were promised a year hence.

One day of institutes is allotted on the basis of 600 farms.

PUBLICATIONS

This part of the work of the Bureau of Farmers' Institutes has been kept well to the front. No portion of the work is more far-reaching, for these publications go not only to all parts of our own state, but over the United States and far beyond the seas. The many voluntary expressions of appreciation that come from near and far assure us that the work is helpful and that it is appreciated.

In September, 1915, Bulletin 75 was issued—"What Shall the Farmer Read?" by F. H. Hall, editor and librarian, New York Agricultural Experiment Station. Besides a discussion on the need for good reading, it consists of an extensive list of desirable books for the farmer, classified in groups according to subject.

In October, 1915, there was issued Bulletin 76, "The Horse Industry in New York State," which covers 278 pages, and consists of 36 articles by 27 different writers, all of whom are authorities in their special lines. It contains 80 illustrations, a number of which were from Belgium, showing places and horses that have since been destroyed by the war. The table of contents and writers follows:

Introduction.

Evolution and History of the Horse, M. W. Harper.

Principles of Horse Breeding, M. W. Harper.

The Standardbred Horse, Carl W. Gay.

The Arab Horse, H. K. Bush-Brown.

The Thoroughbred, Lieut. N. C. Shiverick.

The American Saddle Horse, Elise Castleman Railey.

The Hunter, Frank S. Peer.

The Shetland Pony, Julia M. Wade.

The Welsh Pony, Julia M. Wade.

The Draft Breeds of France, E. S. Akin.

The Belgian, E. S. Akin.

The Draft Breeds of Great Britain, E. S. Akin.

Hackney Breeding in America, Reginald C. Vanderbilt.

Coach Horses, DeVoe Meade.

Asses and Mules, Dr. C. W. Brodhead.
The Horse on New York State Farms, Dr. M. Hamilton.
The Best Horse for the Farmer to Breed, J. H. S. Johnstone.
Care of the Stallion, J. Gelder.
Care of the Brood Mare and Her Colt, Lowell Roudebush.
Fall Versus Spring Colts, Edward van Alstyne.
Training the Colt, H. E. Hopkins.
The Horses' Feet and Their Care, Dr. C. W. Brodhead.
Care of Horses' Teeth, Dr. C. W. Brodhead.
Feed and Care of the Horse, F. C. Minkler.
Horses at the New York State Fair, Dr. H. S. Wende.
The Need of a Stallion Law, Dr. W. G. Hollingworth.
Effects of the Wisconsin Stallion Law, Dr. A. S. Alexander.
Stallion Enrollment Law, E. S. Akin.
Community Effort in Draft Horse Breeding, J. L. Edmonds.
Horse Breeding in the West and East, Forest Henry.
Glanders or Farcy, Dr. Charles Linch.
Diseases of the Limbs and Bony Structure, Dr. J. F. DeVine.
Distemper and Diseases of the Respiratory Organs, Dr. E. L. Volgenau.
Colic and Azaturea, Dr. M. Hamilton.
Horse Companionship, Frank S. Peer.
New York State Draft Horse Breeders' Club.
Statistics.
Index.

Bulletin 77, "Potato Growing in New York State," was reissued in November, 1915, with the addition of a symposium on standardization of seed potatoes, by Messrs. F. C. Stewart, E. H. Forristall, C. B. Tillson, and O. F. Ross. It contains 34 illustrations and 22 articles, covering 142 pages. The table of contents and writers is given below:

Introduction.
History of the Potato, Edward van Alstyne.
Potato Soils and Their Preparation, Alva Agee.
Seed Selection and Breeding, C. H. Myers.
Some Causes of Poor Stands of Potatoes, F. A. Serrine.
New European Potato Diseases, G. G. Atwood.
Fertilizers and Manures for Potatoes, Edward van Alstyne.
Planting and Cultural Methods, Daniel Dean.
Potato Insects, Bentley B. Fulton.
Potato Diseases in New York State, M. F. Barrus.
Spraying, F. C. Stewart.
Essentials in Marketing, R. H. Cooper.
Successful Cooperative Marketing, W. H. Ingling.
Cortland County Potato Growers' Association, E. H. Forristall.
Potato Machinery, C. R. White.

Potato Growing on Long Island, H. R. Talmage.

The Potato Situation in Western New York, C. R. White.

Potato Growing in Northern New York, C. B. Tillson.

Standardization of Seed Potatoes:

F. C. Stewart.

E. H. Forristall.

C. B. Tillson.

O. F. Ross.

The Potato as a Food, Ida S. Harrington.

Statistics.

Index.

In January, 1916, Bulletin 79 was issued, "The Fruit Industry of New York State," in two volumes, all in all the most comprehensive and voluminous of all the institute bulletins, with the possible exception of Bulletin 44. Volume I contains 354 pages, and takes up the industry as a whole, especially that relating to the apple. Volume II contains 452 pages, and is devoted to pears and other varieties of fruit grown in the state. There are altogether 79 articles with 313 illustrations. The tables of contents and writers follow:

VOLUME I

Introduction.

The Fruit Districts of New York, U. P. Hedrick.

The Nursery Industry in New York, Samuel Fraser.

Various Methods of Refrigeration and Its Advantage to the Public,
George H. McKay.

The Apple Grading Law, B. D. Van Buren.

The Apple-packing Train, F. S. Welsh.

Inspection Work of the Department of Agriculture in Relation to
Horticulture, George G. Atwood.

History of Fruit Exhibits at State Fair, H. B. Knapp.

Horticultural Exhibits and What They Mean to the Fruit Interests of
the State of New York.

Exhibit of New York Fruit at the Columbian Exposition, Edward
van Alstyne.

New York Fruit at the Pan-American Exposition in 1901, F. E.
Dawley.

New York Fruit at the Land Shows and San Francisco Exposition,
Charles G. Porter.

The Western New York Horticultural Society, John Hall.

The New York State Fruit Growers' Association, E. C. Gillett.

Hudson River Fruit Exchange, W. Y. Velie.

The Apple:

Introduction of the Apple into America and New York State,
Charles S. Wilson.

The Apples of New York, S. A. Beach.

Soil Types for Varieties of Apples, H. J. Wilder.

Tillage, W. H. Chandler.

Cover Crops, R. D. Anthony.

Intercropping the Young Orchard—From an Economic Standpoint,
M. C. Burritt.

Sod Mulch vs. Tillage for Apple Orchards, W. D. Auchter.

Fertilizers for Fruits, U. P. Hedrick.

Care of Young Trees, William Hotaling.

Care of the Old Orchard, Roy P. McPherson.

Pruning, Edward van Alstyne.

Insects Particularly Affecting the Apple, E. P. Felt.

Some of Our Most Common Apple Diseases, H. H. Whetzel and
Lex R. Hesler.

Dwarf Apples, U. P. Hedrick.

The Profits on a Barrel of Apples, U. P. Hedrick.

Central Packing Houses for New York Fruit, F. S. Welsh.

Selling on Commission and Buying Direct from Producers, J. H.
Killough.

Exporting Apples, C. W. Kimball.

Auction Houses as Distributors of Fruits and Vegetables, Victor K.
McElheny, jr.

Receipts and Prices of Apples in New York City and Exports of
Apples from United States and Canada, H. B. Knapp.

The Evaporated Fruit Industry in New York State, E. W. Catchpole.

Grafting and Budding, George G. Atwood.

Physical Injuries to Trees, B. D. Van Buren.

Statistics.

Index.

VOLUME II.

The Pear:

Varieties of Pears for Eastern New York, J. R. Cornell.

Varieties of Pears for Western New York, Ira Pease.

Cultural Methods for Pears, Ira Pease.

Pruning Pear Trees, Arthur Farrand.

Some Insects Attacking the Pear, and Their Control, P. J. Parrott.

Diseases of Pears, M. F. Barrus.

Packing and Marketing Pears, Arthur Farrand.

Statistics.

The Peach:

Peaches in Eastern New York, P. L. Husted.

Peaches in Western New York, E. H. Anderson.

Cultural Methods for the Peach, and Marketing, A. T. Henry.

Pruning the Peach, M. A. Blake.

Insects and Diseases of the Peach, L. F. Strickland.

Packing and Marketing the Peach, A. G. Gulley.

Statistics.

The Cherry:

- Varieties of Cherries, U. P. Hedrick.
- Cultural Methods in Growing the Cherry, W. L. McKay.
- Cherry Insects, C. R. Crosby.
- Diseases of the Cherry, L. R. Hesler.
- Marketing Cherries, C. K. Scoon.
- Statistics.

The Plum and Prune:

- Varieties of Plums, U. P. Hedrick.
- Cultural Methods and Pruning for Plums and Prunes, G. H. Howe.
- The Common Insect Enemies of the Plum, F. H. Lathrop.
- Diseases of the Plum, L. R. Hesler.
- Marketing Plums and Prunes, G. H. Howe.
- Statistics.

The Quince:

- Quinces, H. L. Brown.
- Statistics.

The Grape:

- A Look Backward on the Grape, L. H. Bailey.
- Varieties of Grapes, U. P. Hedrick.
- Grape-growing Sections of New York, F. E. Gladwin.
- The New York Wine Industry, L. J. Vance.
- The Grape Juice Industry, Gerald Frey.
- Cultural Methods for the Grape in New York, F. E. Gladwin.
- Control of Insects Injurious to the Grape, F. Z. Hartzell.
- Diseases of Grapes, Donald Reddick.
- Production and Marketing of Grapes in the Chautauqua Belt,
S. J. Lowell.
- Hybrid Grapes at Geneva, R. D. Anthony.
- Statistics.

The Strawberry:

- Strawberries, William Palmer.
- Statistics.

The Raspberry:

- Raspberries, O. M. Taylor.
 - Red Raspberries.
 - Black Raspberries.
 - Purple Raspberries.
- Statistics.

The Blackberry and Dewberry:

- Blackberries and Dewberries, O. M. Taylor.

The Currant:

- Currants, O. M. Taylor.

The Gooseberry:

- Gooseberries, O. M. Taylor.

Statistics of Small Fruits.

Fruits in the Home:

- The Dietetic Value of Fruit, I. S. Harrington.

Index.

In June, 1916, there was published Bulletin 85, "Dairy Improvement Associations of New York State," by Mr. A. J. Nicoll. This contains 57 pages, and consists of a history of the cow-testing work in the state with tables showing accomplishment. The table of contents and the list of contributors follow:

Introduction.

Early History of the Cow-Testing Association, A. J. Nicoll.

Need of Dairy Improvement Association Work in New York State,
A. J. Nicoll.

Plans for the Future, A. J. Nicoll.

The Dairy Improvement Association.

Wyoming County's Dairy Improvement Associations, H. M. Bowen.

Fundamentals in Dairying, Edward van Alstyne.

A new question leaflet was printed for use in the institutes, of which the following is a copy:

GRAPES

F. E. GLADWIN, *Associate Horticulturist, New York Agricultural Experiment Station, Fredonia, N. Y.*

SOILS

1. What are the requirements of a good grape soil?
2. What are the advantages of a gravelly soil; the disadvantages?
3. What are the advantages of a clay soil; the disadvantages?
4. Does the character of the soil influence the sugar content of grapes?
5. Is there any difference in the keeping quality of grapes from various soils?
6. Is it good practice to set grapes on land that has been heavily cropped right up to the time of planting?
7. Is sub-soiling desirable before setting the vineyard?
8. Is tile drainage necessary for the growing of grapes?
9. In a regular system of drainage, how far apart should the laterals be located?
10. What size tile should be used?
11. Do side hills require drainage?
12. Is there a relationship between poor drainage and winter injury?
13. Do grapes varieties show a soil preference?

VARIETIES

14. Is there a demand for varieties other than the Concord?
15. Name two commercial varieties: (a) black; (b) red; (c) white.
16. Are any of the newer varieties desirable from a commercial standpoint?
17. How are new varieties obtained?
18. Do grape varieties require cross-pollination?
19. Is it advisable to set solid blocks of little-known varieties without knowing whether they are self fertile or not?

20. Can the originator's statement of a new variety be taken as reliable?
21. In what respects is it desired to improve the Concord?
22. Does it follow that because a variety does well in one locality it will in another?
23. Is the planting of wine grapes to be recommended?
24. Name some of the principal wine varieties used in New York?

PLANTING

25. When is the best time to plant?
26. What distances apart should grapes be set?
27. How deep should grapevines be planted?
28. How should the vines be pruned at planting?
29. What fertilization should be given at this time?
30. Which is the better plan, to set in holes or furrows?
31. Can grapes be successfully planted in crowbar holes?
32. What grade vines should be planted? What age vines?

CULTIVATION

33. Why is it essential that thorough tillage be given?
34. What kind of cultivators should be used?
35. Which is the more essential in cultivation, the killing of weeds or the maintaining of a dust mulch?
36. When should the vineyard be plowed?
37. How deep?
38. Does the cutting away of roots in a well-cared-for vineyard seriously injure it?
39. Is the diamond-tooth cultivator a good tool to use in the vineyard?
40. Is fall plowing advisable?
41. Is it good practice to leave the freshly turned furrows for some time after plowing?
42. When should horse-hoeing be done?
43. Can a vineyard that is plowed up to the vines each spring be kept level through subsequent cultivation?
44. How often should the vineyard be cultivated after plowing?
45. When should cultivation be stopped? Why?
46. Is it necessary to plow up to the vines in the fall?
47. Can a vineyard be profitably maintained without plowing?
48. How would the later plowing affect such a vineyard?
49. Is it possible to maintain a vineyard through the sod-mulch method?
50. How large a vineyard can a good team keep in good tillage?

COVER CROPS AND GREEN MANURES

51. What are the benefits to be derived from their use?
52. When should they be sowed?
53. What are the best vineyard cover crops?
54. In what amount should each be sown?
55. When should they be plowed under?
56. Are cover crops ever injurious?

FERTILIZERS

57. What fertilizers are the best for vineyards? In what amounts? When applied?

58. Can a vineyard be maintained through the use of commercial fertilizers?
59. Of how much value is two forks of stable manure per hill?
60. Is it profitable to use car manure?
61. Do fertilizers favor maturity of fruit and wood?
62. How should manure be applied? When?
63. How can manure be kept to the best advantage to retain the plant food?
64. Which is the more economical fertilizer to buy—the low grade or the high?
65. Is it possible to use too much manure in the vineyard?
66. Can fertilizers or manure take the place of cultivation in the vineyard?
67. Is it more economical to buy mixed fertilizers or practice home mixing?
68. Of what value is lime in the vineyard? What kind, and how much should be applied?

PRUNING

69. When should grapes be pruned?
70. How many canes should be left?
71. Is the cane and spur renewal method to be recommended?
72. What are its advantages?
73. How often should the old stems and arms be renewed?
74. How should the renewal stem be cared for the first two years?
75. What are some of the objections to the Chautauqua or arm system?
76. Are there other desirable methods of putting up the vines?
77. Describe the single-stem, two-cane Kniffen method of training?
78. Describe the umbrella Kniffen system.
79. What are their advantages?
80. Should all varieties be trained the same?
81. How should the young vineyard be pruned the first two years after planting?
82. Is summer pruning a profitable practice with commercial Concord vineyards?

DISEASES

83. What is the cause of dead arm? How should it be treated?
84. What is powdery mildew? What conditions favor it? How may it be controlled?
85. What causes "shelling"? Can it be controlled?
86. Are these diseases carried through cutting wood?
87. What is the cause of the leaves drying out and dying, and the checking of ripening of fruit and wood?
88. What conditions favor winter injury? How is such injury manifested?
89. How should winter-injured vines be treated?

MISCELLANEOUS

90. Is there danger of an overproduction of table grapes?
91. Is the growing of other fruits more profitable than grape growing?

INSECTS

92. Describe the rose chafer?
93. What is the life history of the rose chafer?
94. What is the best method of controlling the rose chafer?
95. What effect has the environment of a vineyard on the severity of rose chafer attack?
96. What is the life history of the steely beetle?
97. What is the best method of controlling the steely beetle?
98. What surroundings are most favorable for attack by steely beetle?
99. What is the life history of the grape root-worm?
100. What is the best method of controlling the grape root-worm?
101. Why do the number of grape root-worms fluctuate so markedly certain years?
102. What is the cause and remedy for "wormy" grapes?
103. Give the life history of the grape-berry moth?
104. Why are there usually more wormy grapes near woodland or waste land?
105. Give the life history of the grape leaf hopper?
106. What is the best remedy for the grape leaf hopper?
107. What effect have overwintering weeds and grass upon the grape leaf hopper?
108. Will cover crops cause vineyards to be more severely attacked by leaf hoppers?

SPRAYING

109. Give directions for the annual spraying of a vineyard that will keep the grapes in the healthiest state and yet be of minimum expense.
110. Is powdered arsenate of lead better than the paste form?
111. Is arsenite of zinc a safe insecticide for grapes?
112. What do you know about Kiltone?
113. What is the best fungicide for grapes?
114. How should bordeaux mixture be prepared?
115. Can soluble sulphur or lime-sulphur be used on grapes?
116. What is the best type of sprayer for vineyards?
117. What are the essentials of good spraying?

NEW MATTER ON BACKS OF PROGRAMS

FACTS WORTH REMEMBERING

An inch of rainfall means 3,630 cubic feet per acre, or 101.1 tons.

A 3-in. pipe will discharge, under pressure, 100 gals. of water per minute.
Nominal horse power required for a 10-ft. lift — 1.

CARRYING CAPACITY OF PIPES, GALLONS PER MINUTE

Size of pipe	1 in. fall per 100 ft.	2 in. fall per 100 ft.	3 in. fall per 100 ft.	6 in. fall per 100 ft.	1 ft. fall per 100 ft.
3 in.	13	19	23	32	46
6 in.	75	105	129	183	253

CAPACITY OF CISTERNS

Size	Barrels per feet in depth	Barrels per 5 feet in depth	Gallons per 5 feet in depth
5 ft. x 5 ft.	5.92	29.60	947.2
6 ft. x 6 ft.	8.54	42.70	1,366.4
7 ft. x 7 ft.	11.63	58.15	1,860.8
8 ft. x 8 ft.	15.19	75.95	2,430.4

GOVERNMENT RECIPE FOR WHITEWASH

Slake half a bushel of unslaked lime with boiling water, cover during the process to keep in steam, strain the liquid through a fine sieve or strainer, and add to it a peck of salt previously dissolved in warm water, three pounds of ground rice boiled to a thin paste and stirred in while hot, half a pound of Spanish whiting, and one pound of clear glue, previously dissolved by soaking in cold water and then hanging over a slow fire in a small pot hung in a larger one filled with water. Add five gallons of hot water to the mixture, stir well and let it stand a few days, covered from dirt. It should be applied hot.

A pint of this wash mixture, if properly applied, will cover one square yard, and will be almost as serviceable as paint for wood, brick, or stone, and is much cheaper than the cheapest paint.

NUMBER, WEIGHT, AVERAGE COST OF SEED, AND QUANTITY TO SOW

Name of seed.	Number of grains of pure seed per lb.	Amount to sow per acre of pure seed	Weight per bu. in lbs.	Cost of seed per acre.
		<i>Lbs.</i>	<i>Lbs.</i>	
Red top.....	603,000	7	32	\$1 45
Orchard grass.....	579,500	35	16	5 60
Timothy.....	1,170,500	10	45	60c. to 1 00
Alsike clover.....	707,000	5 to 10	60	85c. to 1 75
Red clover.....	279,000	10 to 15	60	\$1 70 to 2 50
Alfalfa.....	209,500	15 to 20	60	3 00 to 4 00

NEW YORK STATE LEGAL WEIGHT PER BUSHEL OF FARM PRODUCTS

Lime or common salt.....	70 lbs.	Barley, apples, buckwheat.....	48 lbs.
Wheat, peas, potatoes, cloverseed, beans	60 "	Timothy, herd's-grass seed.....	45 "
Onions.....	57 "	Dried peaches.....	33 "
Indian corn, rye, fine salt.....	56 "	Oats.....	32 "
Flaxseed.....	55 "	Dried apples.....	25 "
Sweet potatoes.....	54 "	Bran, shorts.....	20 "
Corn meal, rye meal, carrots.....	50 "		

RULES FOR MAKING CONCRETE

EQUIPMENT

Wooden measuring box: 2 feet long, 1 foot wide, 1 foot high, without bottom, holding 2 cubic feet. Nail a 1-inch by 3-inch board, 5 feet long, at the top on each side for handles.

Platform: 8 feet by 12 feet, of 1-inch matched lumber, four 2-inch by 4-inch scantling.

Sand screen: Mesh $\frac{1}{4}$ -inch by 5 or 6 inches, nailed to a wooden frame 2 feet by 5 feet and set at an angle of 45 degrees.

MATERIAL

Gravel, sand, cement, water. When screening what is called "bank-run gravel," that is, gravel running from a fine sand to stones $1\frac{1}{2}$ inches in diameter, all stones passing through the screen will be $\frac{1}{4}$ -inch or less in diameter, and are classified as sand. All other stones not passing through the screen are classified as gravel. Crushed hard stones may be used in place of gravel.

PROPORTIONS

A 1-3-5 mixture, that is, 1 cubic foot of cement (1 sack of cement), 3 cubic feet of sand and 5 cubic feet of gravel, will make about 5 cubic feet of concrete.

For engine foundations, fence posts, silos, troughs, and foundation walls use a 1-2 $\frac{1}{2}$ -4 mixture.

MIXING

Thorough mixing together of the sand, gravel, and cement, before adding the water, is necessary. After mixing, form the dry materials into a crater, pouring the water on the board in the center, and shoveling the mixture into the water from the inside. Continue this method until the mixture is soft and mushy.

GENERAL RULES

1. Concrete should not be mixed ahead.
2. To unite new concrete to concrete already hardened, wet the surface of the hardened concrete thoroughly and cover with grout, made of water and cement to the consistency of cream; apply the new concrete at once.
3. Large stones may be used in concrete foundations provided the stones are wet thoroughly before placing in the wall.
4. Salt is injurious to concrete.

STATE OF NEW YORK
DEPARTMENT OF AGRICULTURE

CHARLES S. WILSON, Commissioner

Bulletin 87

Grasses and Leguminous Crops in New
York State

Issued by the Bureau of Farmers' Institutes and Compiled under the
Supervision of the Director

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"And he gave it for his opinion that whosoever could make two blades of grass grow on a spot of ground where only one grew before, would deserve better of mankind and do more essential service to his country than the whole race of politicians' put together."

DEAN SWIFT.

INTRODUCTION

Many residents of the state have expressed surprise when told that hay and forage are the most important of New York State's crops, having a total value according to the census of 1910 of \$77,360,645; worth nearly twice as much as the cereals — which really belong to the grass family — and three times as much as all fruits.

Not only is hay most important from the standpoint of money values, but because it is fundamental to real agricultural prosperity. The prophet's words were true in a broader sense than he applied them when he said, "All flesh is grass." Furthermore, it is a crop that has a state-wide adaptation, hay land constituting about one-third of the improved acreage of the state. In spite of all this, it is doubtful whether any crop receives so little attention. The farmer who is giving the care to his grass lands that he does to his cultivated crops is the exception. The pastures, most times, are in a state of nature, not of grace, having never been regenerated. They remind the passer-by of Bryant's lines:

"The melancholy days are come, the saddest of the year,
Of wailing winds and naked woods, and meadows brown and
sear."

The saddest note of this is that much of the unfavorable condition of the meadows might have been prevented.

The necessity, in most places, of creating favorable conditions for alfalfa is doing much to make plain the fact that like efforts will produce correspondingly good results with all kinds of hay. The marked returns resulting from such attention, as set forth in this bulletin, is one reason for its publication.

Attention is called to the title, "Grasses and Legumes." Frequently these are classed under the general head of grass or hay, yet they belong to two separate families. Legumes are plants

bearing a seed vessel with two valves — a pod, to which belong the clovers, beans, peas, and all plants of like character. The grasses are distinguished by their jointed stems; sheathing leaves, with narrow and spear-shaped blades; and flowers borne in spikelets — any grain before the ear is formed. The legumes have the marvelous power of obtaining nitrogen from the soil air by means of the nodules on their roots, which, decaying, enrich the soil. Because of their high protein content, the legumes are of special value for feed for all kinds of live stock. A fact often lost sight of in this day of indiscriminate purchase of concentrated feed is that the profit from stock feeding has come primarily from forage grown on the farm.

A bulletin with the above title might properly contain the cereals, headed by that king of all grasses — corn. Purposely, they are omitted — first, because the object of this bulletin is to concentrate thought on those plants which are chiefly used as hay, and their twin sister, pasture grass; secondly, the cereals are exhaustively treated in Bulletin 62, "Report of Farmers' Institutes," June 15, 1915, which may be had on application.

Not all the varieties of either legumes or grasses treated in these pages are necessarily recommended to the farmers of New York State. Several of them, such as crimson clover and cow peas — primarily southern plants — as well as several grasses whose virtues are often extolled by vendors or enthusiasts but whose values have not been generally manifest in this state, have been given a place in order that their characteristics may be understood.

In no bulletin issued by this bureau have there been so many contributors from so wide a range of territory. It is a compliment to the Bureau of Farmers' Institutes and to New York farmers to have contributions from four writers from the United States Federal Department of Agriculture and two from the experiment stations of the states, with that Nestor of those who have made agriculture profitable and respected — ex-Secretary of Kansas, Coburn — at their head. These are all busy men upon whom New York State had no claim, but they have cheerfully given their assistance to supplement the efforts of E. G. Montgomery, professor of farm crops at the State College of

Agriculture, whose advice as to subject matter and contributors has been invaluable; the members of the staff of the college — always ready to render a loyal service to the Institute Bureau; and our own corps of institute and farm bureau workers, to all of whom the compiler records his appreciation and thanks.

If this publication will help to make good the oft-abused and misquoted lines of Swift on the title page, it will have accomplished its purpose and be more than an adequate reward for the efforts of all those who have had to do with its make-up.

EDWARD VAN ALSTYNE,
Director of Farmers' Institutes.

HISTORY AND CHARACTERISTICS OF TIMOTHY

JARED VAN WAGENEN, JR.

Farmers' Institute Lecturer



Timothy (*Phleum pratense*) is known as herd's-grass in New England and is sometimes called meadow cat-tail.

In New York State the most important single crop is our meadows and pastures, and the one grass found on every farm throughout the years—the one grass that in value and in general use overshadows every other—is timothy. Our agricultural literature and our seedsmen's catalogues contain the names of many grasses; but, outside of a little red top, timothy is the one true grass almost universally sown in our state.

HISTORY

There is a great deal of confusion as to the origin and history of the plant. There is a somewhat remarkable story (not well supported) as to how one Herd found it growing wild in a swamp near Piscataqua, New Hampshire, and was the first to sow its seed. It is interesting that New England farmers still call it herd's-grass, although it is not settled whether this name embalms the memory of its reputed discoverer or merely indicates its use as food for the herd.

The name "timothy" is derived from Timothy Hanson, who introduced its cultivation into the Carolinas, about 1720. From thence it is said to have been later carried to England. Some of our best botanists, however, hold to the opinion that it is a native of the temperate regions of both hemispheres.

DISTRIBUTION

In America, at least, timothy finds its most congenial habitat in the northern part of the corn-belt states, the northeastern states,

eastern Canada, and, in limited areas, on the Pacific coast. It is most at home here because of the fairly cool climate and the relatively abundant rainfall.

The temperature requirements are interesting and important. In a general way it is at its best in those regions bordering the Canadian line, and south of Pennsylvania it tends to give place to other grasses. On the other hand, it is said to grow luxuriantly far north in the province of Quebec, Canada, where the winter temperatures are exceedingly low.

Where other conditions are right, timothy will benefit from abundant rainfall; hence we find that only in seasons when there is an abnormally large supply of moisture does it reach its best development in our state. On the other hand, the plant fails under the semiarid conditions of the states in the plains.

The ideal timothy soil is one that is fertile, with a good percentage of clay, and one that is naturally moist with a water table not too far below the surface. These conditions are most nearly fulfilled on certain alluvial river bottoms, and on such lands it may continue to yield heavy crops almost indefinitely without reseeding.

The type of growth of the plant is notably influenced by the soil. On rich, moist lands it tillers freely and the root system is markedly fibrous; when grown on poor, dry locations, the plants are relatively dwarfed, but the bulb-like enlargements at the base of the stems or culms are more highly developed.

COMPOSITION

From the standpoint of the dairyman needing protein roughage, the composition of the timothy plant is unfortunate because of the comparatively low content of protein and the large percentage of carbohydrates and rather unpalatable fiber. These unfavorable qualities grow more marked as the plant matures. An average of 68 American analyses of timothy hay show an average of only 5.9 per cent of protein, and it is estimated that only about 48 per cent of this is digestible. It may be said in passing that tables of digestibility are far less dependable than our knowledge of percentage composition. The foregoing may be compared with an average of 12.3 per cent of protein in red clover hay with a digest-

ibility of about 60 per cent. The lesson of this is that timothy at its best compares unfavorably with the legumes where protein is a prime requisite; and the more mature it is, the less desirable it becomes. Timothy hay seems especially unsuited for sheep; but by common consent it is well adapted to horses, where it is usually fed in connection with considerable amounts of grain.

BREEDING OF TIMOTHY

PROFESSOR C. H. MYERS, Ithaca, N. Y.

Department of Plant Breeding, Cornell University



Timothy is the most important hay grass in America, and, according to Piper,¹ its culture is older than any other grass. As early as 1807 it was the most important hay crop in the United States, and it still maintains its supremacy, in spite of many rivals that have been introduced from time to time.

IMPORTANCE OF BREEDING FOR VARIETIES OF TIMOTHY

Yet, in spite of its importance and extensive culture, the varieties have never been separated from the composite crop known generally as timothy. Most of our more common and important farm crops have been classified into varieties. Thus, we can buy commercially many different true varieties of corn, wheat, oats, potatoes, and the like. But when we come to purchase timothy seed, our choice is limited to a number of different brands, which are not varieties at all but merely trade names given by various seedsmen.

From the facts learned in extensive breeding work with timothy, we now know that there are many varieties, each differing from the other with respect to certain definite characteristics, which breed true. In other words, any field of timothy consists of a composite mixture of possibly a dozen or more varieties or types, although to a casual observer it would seem to be quite uniform. It is self-evident that the yield and quality of any field of timothy, to a certain extent, is an average result produced by the growth and development of these different varieties or types, each having its own individual characteristics that are peculiar to itself and differing from those of its neighbors. If all these varieties in a field had desirable characteristics, in the end results might not be

¹ Piper, C. V., *Forage Plants* (1914), p. 123.

bad; but many of them have undesirable characteristics. Thus, the advantage of having a field sown to seed of only one variety or type which has desirable characteristics is readily recognized.

HOW NEW VARIETIES ARE PRODUCED

It should be of interest to know how varieties of timothy are obtained. There are two methods that may be employed by the plant breeder in the production of new varieties. Often these two methods are practiced at the same time. But whether one or both are used, it is rightfully considered as breeding work.

Hybridization

The first of these methods is hybridization. In this process, the pollen from one individual plant or flower is applied to the stigma of another. The seed produced by this cross obviously contains the characteristics of both parents. The plant coming from the seed produced in this cross belongs to what is called the first generation. It may resemble either of the parents with respect to certain characteristics or possibly it may resemble neither, but will be some kind of blend or intermediate between the two. The plants that come from the seed produced in the first generation belong to what is called the second generation. It is in this and succeeding generations that the experimenter looks for new things; it is here that he may get new combinations of the characteristics contained in the original parent plants.

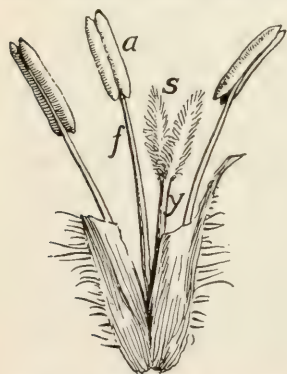


FIG. 597. SINGLE FLORET OF TIMOTHY ENLARGED ABOUT TEN TIMES.

a—anther; f—filament;
s—stigma; y—style

But hybridization work with a plant like timothy is a tedious process and requires considerable technical skill. There are a great many florets on a single head of timothy and these florets are small and delicate to handle. Fig. 597 is reproduced from a drawing of a single timothy floret magnified about ten times. Even in plants having larger flowers that can be more easily crossed, the time required to produce results makes the method

of hybridization less desirable than the second method, which we shall now discuss.

Selection

The method of selection is usually most readily adapted to the improvement of any crop. The technical skill necessary to hybridization work is not required, nor does it take so long a period of time to produce results. The efficacy of selection is based upon the well-known fact that there is a large degree of variability among the individual plants of a given species, which fact has already been emphasized in calling attention to the complex nature of an ordinary field of timothy.



FIG. 598. LEAFY, ERECT, GOOD-YIELDING TYPE OF TIMOTHY.

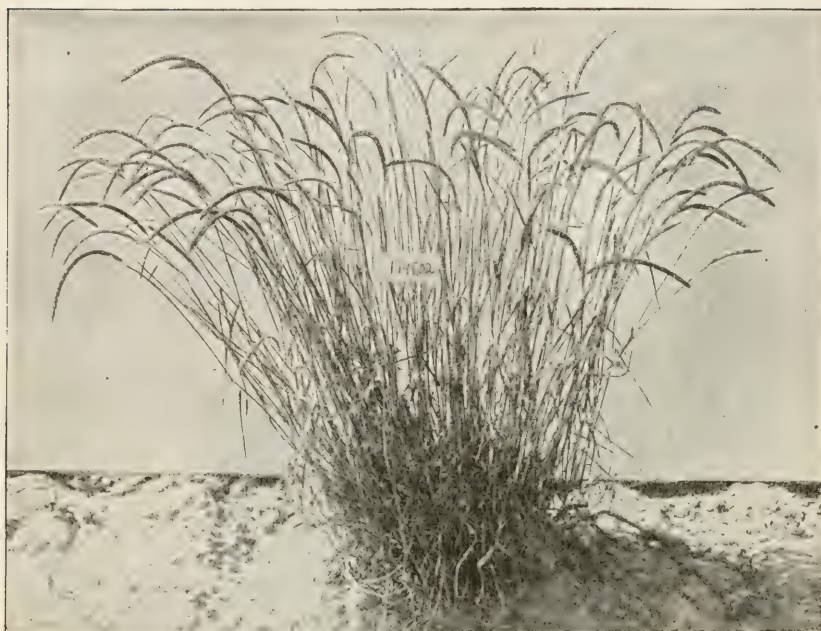


FIG. 599. THIS VARIETY OF TIMOTHY HAS A NODDING HEAD.



FIG. 600. A LOW SPREADING TYPE OF TIMOTHY WHICH MIGHT MAKE A GOOD PASTURE VARIETY.

Selection, then, as the term is used here, does not produce anything new, but merely searches out types already existing, which are unnoticed and unavailable for use because of their close commingling with other types.

The first step in improving a crop by the method of selection might properly be called the inventory; that is, the crop must be studied carefully in order to determine what are the existing types. It is wrong to fix in mind some ideal type and attempt to attain that. After the various types have been isolated, it is then time to ascertain which ones are the more desirable.

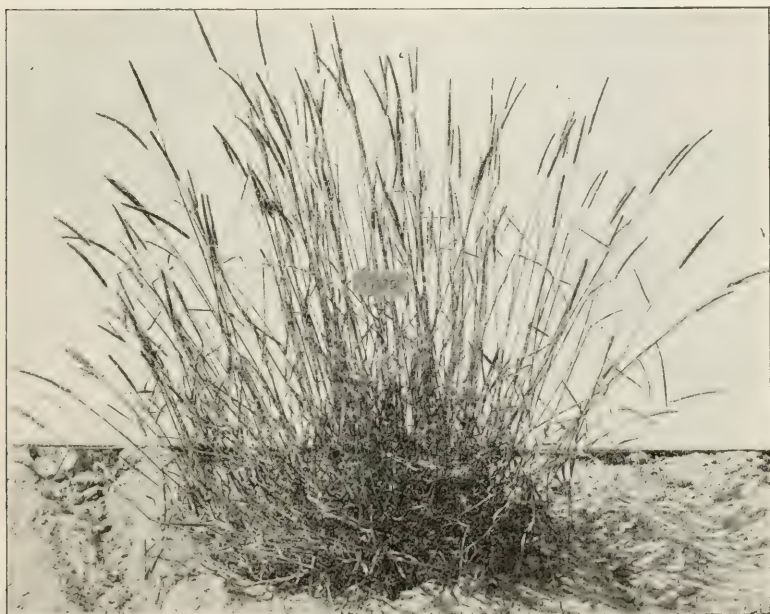


FIG. 601. THIS TYPE SPREADS OVER ENOUGH GROUND BUT IS NOT A HEAVY YIELDER.

The Cornell experiments in the breeding of timothy illustrate the application of this method. At first, timothy seed was collected from a great many sources. Samples of these different lots of seed were germinated in the greenhouse and later the seedlings were transplanted to the field in rows 30 inches apart each way. Care was taken to have only one seedling in a place. In this way each plant had an opportunity to develop to the fullest

extent and it was also possible to study carefully the individual differences of each. Variation was observed in the following characters: height of plant as tall or dwarf; erect or spreading habit; fine or coarse stems; scant or dense foliage; wide or narrow leaves; color of stems, heads, and leaves; slender, short, blunt, cylindrical, or nodding heads; date of maturity; length of blooming period; amount of aftergrowth, rust resistance, and the like. (See Figs. 598 to 602 inclusive.)



FIG. 602. A LOW-YIELDING DWARF TYPE.

In order to study these variations more carefully, selected plants were propagated vegetatively by cuttings or slips of the bulbs formed in the stooling. In this manner a large number of plants can be obtained, which are in reality transplanted parts of the same individual. It is possible that bud variation may occur among these cuttings from the same plant and experiments

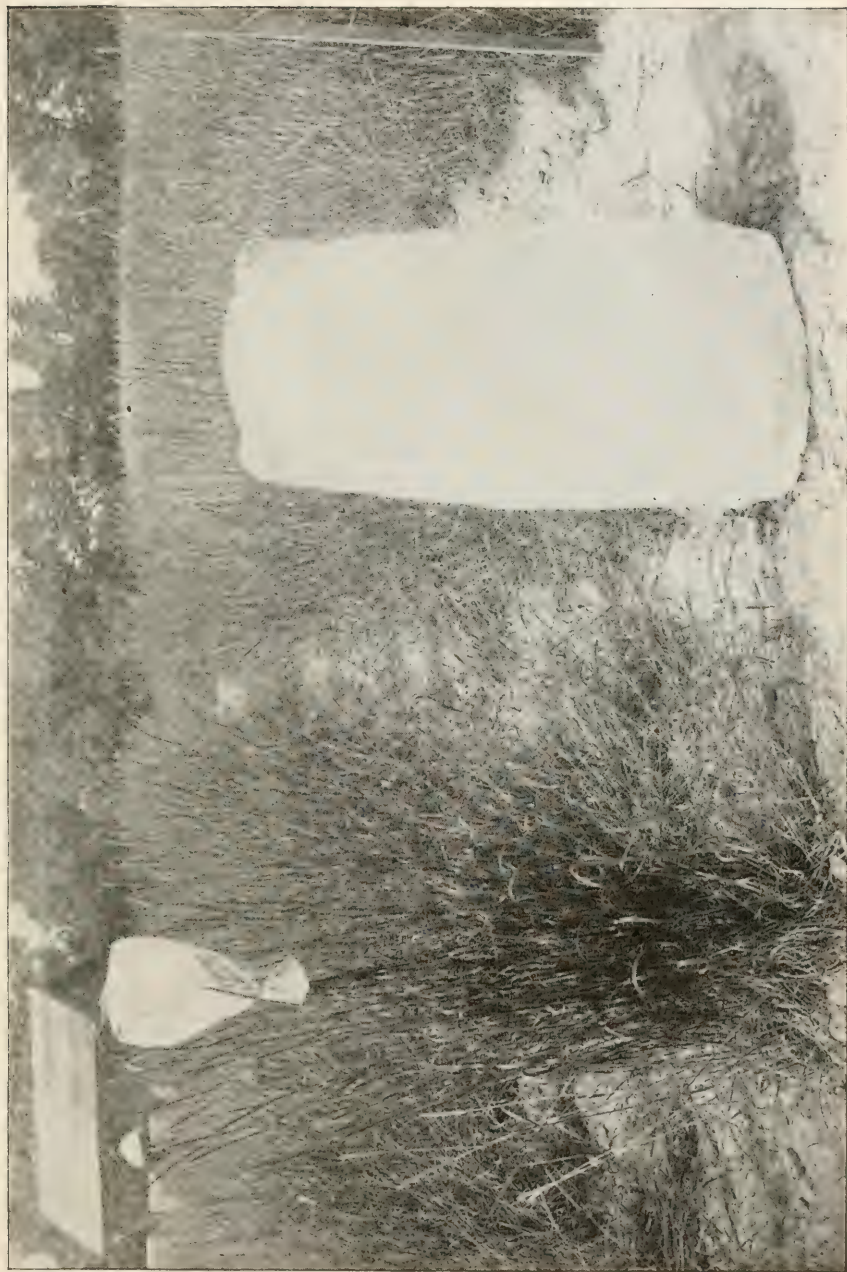


FIG. 603. SHOWING HOW PLANTS ARE COVERED TO OBTAIN INBRED SEED.

are now in progress to determine the amount of this variation. But in general, the clons (cuttings) from a single parental plant are quite uniform, and they furnish an excellent means for a more complete study than can be made of one individual plant.

Environment is a very important factor in the development of any plant. Considerable variation may be produced by changing the environment. Such variation is not inherited and is of no practical value to the plant breeder. On the other hand, there are variations that are inherited, or, as we sometimes say, that come true to seed. In order to make intelligent selections, the experimenter must determine which variations are transmitted to the offspring.

In order to study the transmission of these different types, inbred seed was obtained by covering a bunch of heads with a paper bag before blooming time (Fig. 603). This inbred seed was carefully germinated in plats of sterilized soil, and the young seedlings were transplanted to the field. Twelve or fifteen seedlings from each parental plant were planted in a single row. The rows were three feet apart and the plants were thirty inches apart in the row. By thus comparing the plants of a single row with the parent plant and with each other, it was possible to observe to what extent the characters in question were transmitted. In this test were included a large number of promising hay types, as well as many others of no apparent value, the latter being included for their scientific interest.

Not all of the varying characters observed in the original selections were inherited, but there have been more than two hundred definite types of timothy isolated. Figs. 604, 605, and 606 are reproduced from photographs of some of these individual rows. The uniformity of the plants within the same row is striking, but not more so than the differences between the individual rows. In these instances we know that the differences are due to the nature of the variety or type and not to variations in soil or treatment, for the treatment was uniform for all the rows and between any two neighboring rows there was only a space of three feet. Yet the type of plants is remarkably different.

As soon as the seed transmission of desirable types was determined, the next thing in order was to increase the seed of the



FIG. 604. EACH ROW IS OF A DIFFERENT VARIETY OF TIMOTHY.

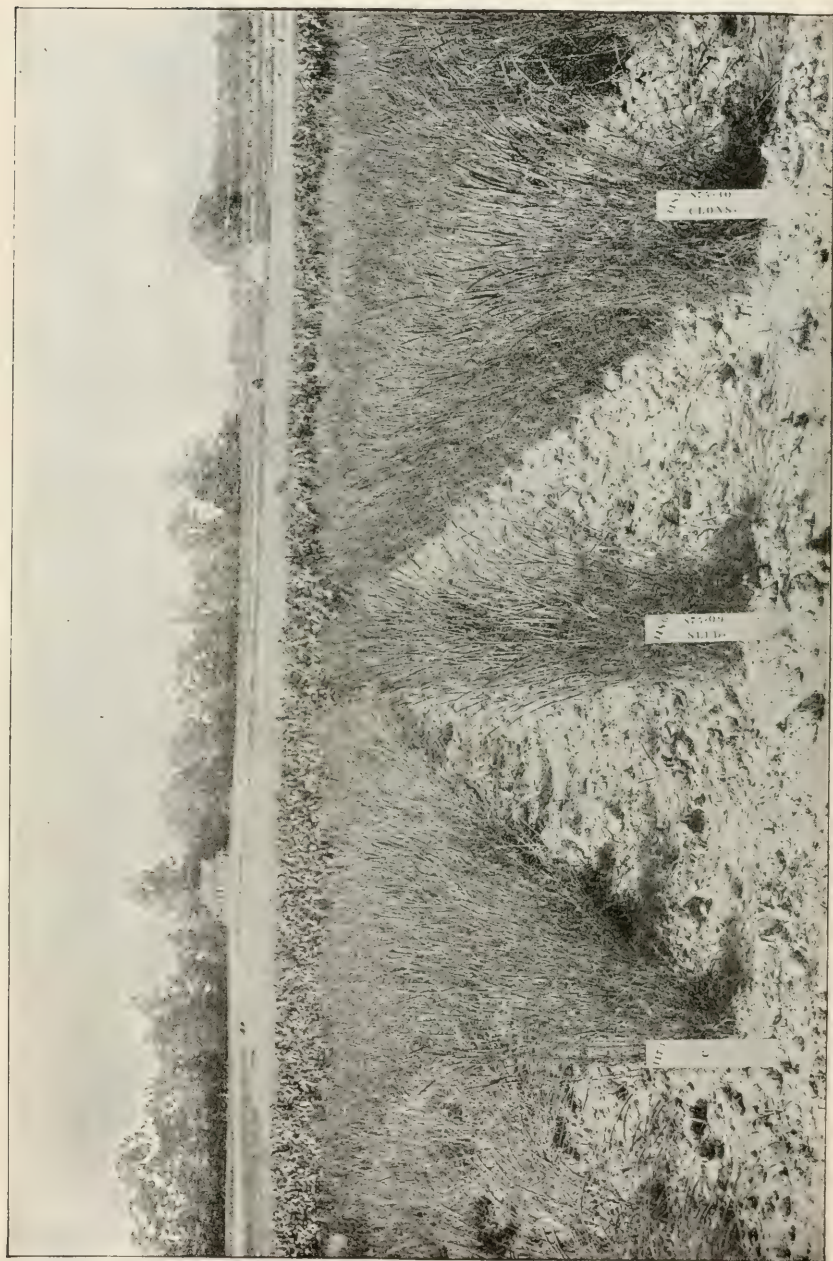


FIG. 605. SHOWING THREE OTHER VARIETIES AS THEY GREW IN THE PLANT ROWS.

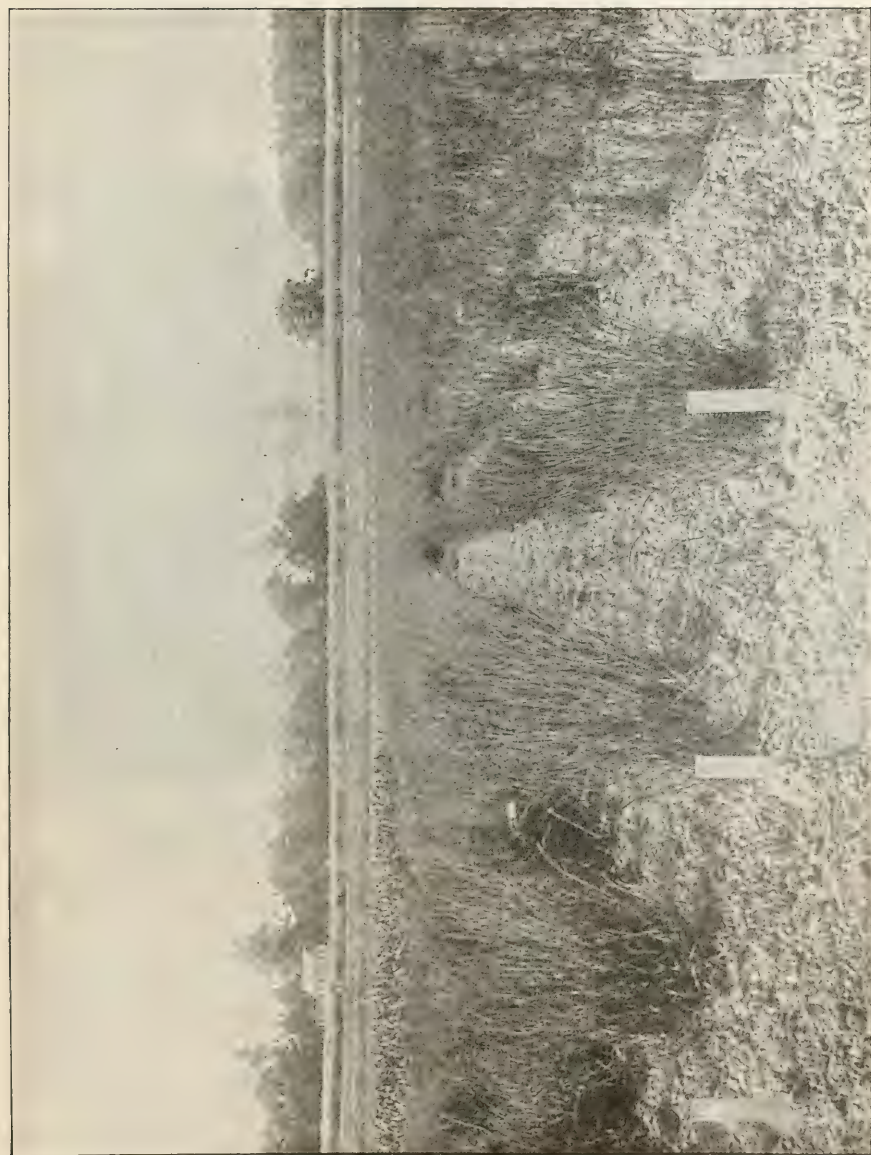


FIG. 606. NOTE THE VARIATION IN THE HABIT OF GROWTH OF THE FOUR VARIETIES SHOWN IN THIS PICTURE.

promising types in order that they could be tested in broadcast plats in comparison with each other and with commercial seed. To do this, either inbred seed or cuttings from the desired types were planted in isolated beds. Such beds should be, at least, two hundred feet apart, and it is still better if they can be surrounded by some tall-growing crop, such as rye. (See Fig. 607.) In these beds the plants were placed eighteen inches apart each way in order to allow of some cultivation. Such a bed, containing four to five hundred plants, under proper conditions, furnishes from



FIG. 607. A GENERAL VIEW OF THE ISOLATED PLATS WHICH FURNISH SEED FOR BROADCAST TESTS AND FOR DISTRIBUTION.

two to three bushels of seed, and with some care can be maintained for a number of years, thus furnishing a constant pure supply.

These isolated beds produce the seed that is used for broadcast plats, which are one rod by four rods, constituting one-fortieth acre. (See Fig. 608) Every fourth plat is a check sown to a good brand of commercial seed. The same amount of seed is sown on each plat, at the rate of 16 pounds per acre. As many duplicate plats as possible of each variety are sown. Altogether, there are some 75 varieties in these broadcast tests at the present time.



FIG. 608. A FEW OF THE BROADCAST PLATS

In the table below are shown the results of the comparisons of four of the earlier selections with their corresponding checks. Two of these selections have been tested for five years, while the other two have been tested for four years. There is an average gain for the four selections of 2,072 pounds per acre.

RESULT OF BROADCAST TEST

COMPARISON OF FOUR NEW SELECTIONS WITH CHECKS

	Selection, pounds per acre	Check, pounds per acre
No. 1.....	*9,088	7,584
No. 2.....	*8,768	3,950
No. 3.....	†8,845	7,944
No. 4.....	†9,190	8,126
Average.....	8,973	6,901

* 5-year average.

† 4-year average

Results from other selections might be included in the above table, but a broadcast test should be run from three to five years before reliable conclusions can be drawn. Results of other series of tests will be published at a later date.

The next problem in this work is a further test of these new varieties under other conditions, and the increasing of the seed so that it may be available in commercial quantities. This is being accomplished by cooperative tests and by the distribution of small amounts of seed to applicants that are willing to handle it carefully. Only a beginning has been made in this work, but so far it gives promise of excellent results. It is expected that within a comparatively short time the best of these new varieties will be available in commercial quantities for general use.

SOILS FOR TIMOTHY IN NEW YORK

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Soils that are good for timothy must meet the needs of the timothy plant. They must fit the structural characters and the physiological requirements of the timothy plant. We shall first review these requirements of the plant with which the soils of the state are to be compared.

SOIL CHARACTERISTIC OF THE TIMOTHY PLANT

Timothy is a forage plant that is valuable for its large leafy growth and palatable nutritious quality. It is a grass and is therefore dependent for its nitrogen supply on suitable compounds of that element in the soil. A generous supply makes for good quality. This suggests a soil rich in organic matter, which is the prime storehouse of nitrogen in the soil.

The root system is fibrous and penetrates rather deeply into the soil. Roughly, its depth of penetration may be measured by the height of the mature plants, which is three to four feet. The bulk of the roots is near the surface — within ten inches, perhaps. This suggests the importance of a friable soil and fair drainage. The fine, fibrous nature of the roots adapts them to the heavier soils — the clays, clay loams, and loam soils.

No studies seem to have been made of the water requirements of the timothy plant. It may be assumed to be like wheat, which belongs to the same family, and has the same type of root system and similar adaptations to climate. This would make the water requirements medium to high. A structural peculiarity of the plant — the corms on the stems — suggest its ability to withstand periods of rather dry weather. Some of the traditions of

its origin suggest a preference for a rather moist to wet soil. John Herd, from whom the synonym of timothy, herd's-grass, is derived, is reported to have found the plant growing wild in a New Hampshire swamp. Certainly it is known to make its largest growth in moist, cool situations.

Finally, the plant is known not to be tolerant of a very acid condition of soil. Rather, it thrives on soil moderately well supplied with lime. A neutral to slightly alkaline soil may be set down as best adapted for its growth. However, it is not so sensitive as red clover and alfalfa, but it readily shows the effects of the conditions from which they fail.

THE GROUPS OF SOIL FOR TIMOTHY

These characteristics mark out the soils on which timothy will thrive. We shall next consider where such soils may be found in New York State, and examine their further characters and mode of occurrence.

The requirements enumerated, as well as the results of rather extensive observation of the growth of timothy on the various soils of the state, enable us to divide the soils adapted to timothy into four main groups; namely, muck and swamp soils, alluvial bottom soils, clay and clay loam, and upland loams and sandy loams. The success of the crop on the several groups of soil from the viewpoint of yield, but not necessarily of quality, may be placed in the order given. The swamp and muck soils will give the largest yield when reasonably drained, although not so much drainage is required as for vegetable crops. This fact, together with the success of the crop on such soil, makes it one of the best to put on such land when first cleared.

Swamp and Muck Soils

The area of muck and swamp soils in the state is between two and three thousand square miles. Of this area the muck and peat soils constitute about one-third. The remainder is made up of areas of soil that now are, or originally were, in a more or less swampy condition and have accumulated sufficient organic matter to have a very dark or black color. Many of these areas have

been drained and are under cultivation. They may range in texture from heavy clay, such as those in southern Niagara County, to loam and sandy loam character, which is the prevailing texture of such areas in the state. The moist condition of all these soils, particularly of the more sandy types, makes them especially well suited to the crop.

Soils of the group generally occur in small bodies widely scattered over the state. They range from spots of a few rods or acres to a few areas that are hundreds of acres in extent. They are most numerous in that part of western New York south of Lake Ontario where the topography is relatively flat and the drainage systems are poorly developed. The larger bodies of muck soil are the Oak Orchard swamp in northern Genesee County, the Montezuma marshes near the foot of Cayuga Lake, the Cicero and Rome swamps around Oneida Lake, several considerable areas up the St. Lawrence Valley, and the Florida marshes in southern Orange County. Much of this area has not been drained and developed. Much of the muck soil that has been drained has been devoted to vegetable crops, to which it is also well suited. Farmers do not seem to have given much thought to the drainage of such soils for timothy, probably because the promised returns are not so spectacular, although they are more certain. The large supply of organic matter in such soils makes it possible to continue to produce crops of timothy for many years without much nitrogenous fertilizer.

While they are not so numerous, there are, nevertheless, many important areas of swampy soil in the hill and mountain regions and in the larger valleys. Many of these may be located by reference to the soil and topographic maps. Some of them, especially in the eastern part of the state, may be rather stony — a condition that tends to make tillage difficult. Such areas are frequently devoted to pasture, but, by the methods that are recognized as effective to improve pastures without plowing, it is possible to improve their stand of hay grasses. On very few of these areas will timothy fail because of lack of lime, although an application may often be helpful, especially in the southern and eastern districts.

The decay of the organic matter in these soils leaves the ash constituent behind. The ash elements are largely lime and have a marked predominance of alkaline material that naturally aids in keeping such land in proper condition for timothy.

Alluvial Soils

The second group of soils suited to the growth of timothy are the alluvial bottom soils along the streams, which have many characteristics that make them desirable. They are generally moist — may be subject to overflow — are usually friable and deep, and have a good stock of organic matter reaching to a depth of several feet. While inclined to be damp or wet in spring, they generally drain off and warm up in early summer about the time the crop is making its maximum development. The permanent character of timothy, which makes unnecessary the early spring seeding, renders it particularly adapted to overflow land.

Only the larger streams have a considerable development of these alluvial soils. The most notable areas are those along the Genesee River and tributary, along the Mohawk, and in some of the larger valleys of the eastern and southern parts of the state. The Middleburg Valley along the Schoharie River is good, although it probably does not excel smaller areas of similar soil along the streams in northern Delaware County, all of which have a dark brown to red color, due to association with the red soils of the uplands.

Along the Susquehanna and Hoosic and other rivers and streams, there are loops of this alluvial soil, generally of a dark color, shading to gray or brown, owing to the presence of organic matter. The material has been washed from the soils of the upland and deposited during periods of overflow. Organic matter is deeply incorporated. It is predominantly of a silty to fine sandy texture. Very seldom does it run to a clay or a light sandy texture. In the Canaseraga and the Conewango valleys, it reaches the latter texture in a few small bodies. The Pawling Valley through Dutchess County has some good stretches of the soil. In northern New York it has a small development.

After a period of years of cultivation to hay, alluvial soils are likely to need a supply of nitrogen, from either fertilizers

or legumes or both, unless it is subject to regular overflow. The use of lime is frequently a factor in the best success on these soils, but is seldom essential to a moderate growth.

Clay and Clay Loam Soils

The third group of timothy soils are the clay and clay loam lands. The fibrous root system of the plant, the difficulty of keeping such soil in a short rotation, and the difficulty from heaving, with which is coupled the prevailing tendency to poor drainage, make hay farming, especially timothy farming, desirable on clay soil. When, in addition to their fine texture, these soils are naturally well supplied with lime, they make an excellent basis for the growth of timothy, and on such soil the plants are unusually long-lived. In southern Niagara County and the adjacent territory, where such soils are extensively developed, excellent timothy meadows six and seven years old have been observed.

The clay and clay loam soils of the state are developed chiefly around the Great Lakes, up the St. Lawrence, and through the Champlain and Hudson valleys. In these regions extensive lake conditions formerly prevailed in which these clays were deposited in quiet water as very fine sediment. These lakes were of glacial origin and lay along the edge of the ice sheet during its retreat. They were very irregular and much drawn out. They were formed at different levels as the water of the lakes receded with the retreat of the ice. Consequently, they seldom form large continuous areas, and do not occur much above an elevation of one thousand feet, extending from this down to one or two hundred feet.

In addition to forming a more or less continuous rim around the Great Lakes, they swing well to the south in the larger valleys of western New York, notably those of the Genesee and the Finger Lakes. In the Hudson Valley, they reach in scattered bodies down to Newburg. The more important developments are the following: in Niagara and Erie counties; considerable bodies in central Livingston, Monroe, Ontario, and Cayuga counties; an extensive development around the southern side of Oneida Lake and around the head of Lake Ontario in Jefferson County; the bench lands along Lake Champlain and the terrace levels through the Hudson Valley from near Fort Edward to Rhinecliff.

A considerable part of the farms of both the Geneva and the Cornell experiment stations are made up of these soils. The clay loam and silty clay loam, rather than heavy clay, predominate. The subsoil is rather more intractable. The heavier soils occur northeast of Buffalo.

The Dunkirk series in the western part of the state and the Vergennes series in the northern and eastern parts are dominant in this group. They are predominantly of a dark brown to gray-brown color and, especially in the subsoil, are calcareous to a notable degree. This is probably due to the association of these lake areas with the outcrops of limestone throughout the state and the calcareous deposits derived from those rocks.

The topsoil is frequently deficient in lime for the best growth of timothy, but the subsoil at one, two, or three feet is usually well stocked with that material. This fact emphasizes the importance of thorough drainage and fairly deep plowing in preparation for the crop, in order that use may be made of the lime in the subsoil.

Better drainage — tile drainage — is perhaps the most important need of these soils. Shallow surface ditches are too much depended on and are not only of small benefit to the crop, but are damaging to the machinery and the good temper of the men who work over them. One serious result of the lack of drainage is heaving of the soil in winter and spring, which kills many plants in the lower parts and patches up the fields with areas of plantain and other weeds.

The supply of organic matter is not large and, consequently, the stock of available nitrogen is not especially large. Without means to maintain this element, the yield is likely to dwindle quickly in practice. It is best supplemented by legumes, stock manure, and chemicals, according to conditions. Top-dressing with chemicals is particularly effective on this soil.

Upland Loam

The fourth group of soils are a miscellaneous lot, made up of many types in a number of series and distributed widely through the state outside of the group already mentioned. They are not notably productive of the crop, but under careful handling very

good results may be secured. Two factors come in prominently to influence the results. These are the lime supply in the soil and and the rainfall of the region.

The better soils of this group belong to the Ontario, Honeoye, and Mohawk series, which are above the average in their supply of lime, especially in the subsoil. These soils are of glacial origin and are related to the limestone exposures of the state. They lie on and to the southward of the limestone outcrops, having been scraped along by the ice in its southward course. Consequently they are found with a more or less hilly surface on the higher lands, facing the Great Lakes and the Mohawk River and in a similar position through the St. Lawrence Valley. There is also a small body of similar soil in northern New York fringing Lake Champlain.

The soil is some grade of loam with a heavier and more compact subsoil, both rather stony. Drainage is uneven and often could be improved by tile, to the marked profit of the owner. The supply of organic matter is moderate and the success of legumes on these soils makes it generally desirable to couple those plants with timothy because of both the larger growth and the better nitrogen supply. Timothy is not long-lived on these soils, generally thinning out after three or four years from seeding.

RELATION OF RAINFALL TO SOIL AND TIMOTHY PRODUCTION

Rainfall is largest in that district centering on Utica and reaching out over a radius of forty to fifty miles. Both annual and summer rainfall are large in this region and favor forage development on soils lighter than are typically suited to the crop.

The general effect of increased rainfall and moisture supply is to make crops that are best suited to heavy soils succeed on relatively lighter soils because of the changes in soil climate that are induced. To a degree, soil and climate variations may compensate each other.

OTHER SOILS

Outside of the primary groups of soil best suited to the production of timothy and occupying perhaps half of the cultivated area of the state, there are extensive areas of soil where timothy

can be made to grow in a very creditable manner. The soils lying on the edge of the fourth group, the calcareous glacial soils, make fairly good timothy land. Further south, in the region of the Volusia soils and in the Hudson Valley on the Dutchess soils, still more difficulty is experienced to secure the best yields. The same is true of many areas of sandy loam soil. And on the light gravel and sandy soils, timothy is not to be recommended as a commercial crop unless very unusual moisture and commercial conditions prevail. The area of soils suited to the growth of timothy is adequate to increase the production greatly.

GRASS INSECTS

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As has been pointed out by the late Professor F. M. Webster, the control of forage crop insects must differ fundamentally in method from the control of the insects of the orchard and garden. The gardener and the orchardist are able to give individual attention to their plants or trees, while the grower of forage crops must have recourse to more wholesale methods of destruction or prevent attack by such adjustments of his farm practices as will least interfere with the growing of a regular succession of crops of the desired kind. In practice this end is to be attained by a proper arrangement of the rotation, by shortening the rotation, and in some cases by plowing at the proper time for the destruction of underground insects.

While the losses to forage crops from insect attack are usually not so apparent as those experienced by the fruit grower, they are none the less real. Much of the loss is caused by insects that work in the soil, where they rarely attract the farmer's attention until after the damage is done. Although we hear comparatively

little complaint about insect injury to the hay crop it is an undoubted fact that the total loss to forage crops in New York State is much greater than that suffered by the fruit interests. It would certainly pay hay growers to give closer attention to the insect enemies of their crops. Feeding a forage crop to a host of hungry insects is even poorer economy than feeding it out to a herd of "robber" cows.

WHITE GRUBS

Several species of *Lachnosterna*

Among the most serious enemies of grasses are the large white, curved grubs that feed on their roots. These grubs (Fig. 609) are



FIG. 609. A WHITE GRUB, TWICE NATURAL SIZE.

the larval form of the large brown June beetles or June bugs (Fig. 610) that come blundering around our lights on summer evenings. In New York State there are over a score of species, but it is quite probable that the greater part of the injury is caused by a much smaller number.

The parent beetles are most abundant in May and June. They feed at night on the leaves of various trees, which at daybreak they desert and

return to the fields. The females burrow into the soil to a depth of two or three inches and there deposit their eggs singly or in small groups. Each female is capable of laying from fifty to one hundred eggs. The eggs are oval, white, and have a diameter of about one-twelfth inch. They lie in small cells composed of soil particles glued together with a sticky substance secreted by the beetle. The eggs hatch in from ten days to several weeks. The young grubs feed throughout the remainder of that season on the roots of grasses a short distance below the surface of the ground. With the approach of cold weather they burrow deeper into the soil and hibernate at a depth of ten or twelve inches. The following spring they return to the grass roots

on which they feed throughout the season. The grubs of some species reach maturity at the end of the second summer, but in the case of our more common species the grubs are not full grown at that time. In the latter case the grubs again descend into the soil for hibernation and return to the grass roots in the spring of the third year. After feeding for a period they become full grown in June or July. The grub then constructs an oval earthen cocoon in which it transforms to a delicate whitish pupa. The insect remains in this condition until the latter part of the summer and then transforms into a beetle. In this condition it remains in the earthen cell until the following spring, when it emerges



(Slingerland photo)

FIG. 610. A JUNE BEETLE WITH WINGS
EXPANDED, NATURAL SIZE.

from the ground. While certain species emerge the second spring after the eggs are laid, and a few do not emerge until the fourth spring, the greater number of our injurious species do not emerge until the third spring. For instance, in the last case the young grubs that hatch from eggs laid in the spring of 1917, feed until the fall of that year, hibernate during the winter of 1917-18, feed again through the summer of 1918, hibernate again as grubs during the winter of 1918-19, complete their growth, pupate, and transform to beetles that season and hibernate as beetles during the winter of 1919-20; the beetles emerge in the spring of 1920.

It will be seen from the foregoing account that the grubs are most destructive during the second season, because it is then that they feed for the longest period and make their greatest growth. The first year the grubs feed only during the latter part of the season and are very small. The third summer they feed only during the early part of the season and only enough to prepare themselves for pupation.

Control. White grub injury to grasses may be avoided in large measure by practicing a proper rotation of crops. As previously stated, the grubs do the greatest injury during the season following that in which the eggs are laid. Observations in Illinois have shown that the beetles prefer to lay their eggs in ground that is well covered with vegetation. Pasture land, wheat, and oats are chosen in the order named. Clover is a relatively immune crop, very few eggs being laid in fields where there is a heavy stand. The measures for preventing white grub injury to grasses are based on the above facts.

Unfortunately it is not possible to take advantage of the fact that the beetles avoid laying eggs on comparatively clean fields, because experience has shown that as a rule in New York the best results are to be obtained by sowing timothy with clover after wheat. But, since the clover predominates in the first year's seeding, it has a tendency to keep the beetles from choosing such fields for egg-laying and thus delays the infestation of the field for a year. This practice of sowing timothy with clover would therefore appear to be justified from the standpoint of the prevention of white grub injury. In the second year's seeding, however, grasses predominate owing to the fact that most of the clover has been killed by the attacks of the clover root-borer. Such fields are then very attractive to the beetles for egg-laying and consequently the longer a field is left in grass the more seriously will it become infested with white grubs. This indicates the importance of adopting a rotation of crops in which fields are not left in grass more than two or at most three years. These measures are in line with the best agricultural practice and if adopted will not only in a large measure prevent white grub injury, but will also encourage the growing of clover, one of the most important factors in successful farming under New York conditions.

WIREWORMS

Several species of Elateridae

The size and value of the grass crop in New York State is annually lessened to a much greater degree than is usually supposed by the attacks of wireworms. Wireworms are elongate, hard-shelled, brownish larvæ (Fig. 611), the immature stages of

medium-sized, dull-colored, snapping beetles or click beetles. They are underground insects that injure the plants by feeding on their roots. There are several species that injure grass in the state, the most important of which are, the wheat wireworm (*Agriotes mancus* Say), the corn wireworm (*Melanotus communis* Gyllenhal), *Drasterius elegans* Fabricius, and several others. The beetles appear in May and June and the females deposit their eggs in the soil. The beetles are from one-third to one-half inch in length, dull grayish-brown in color, and have the peculiar habit of snapping themselves into the air when laid on their backs. The young wireworms feed on the grass roots for several seasons, the various species differing in the length of their life cycle from three to six years. The wireworm larvae reach maturity early



FIG. 611. A WIREWORM, TWO AND ONE-HALF TIMES NATURAL SIZE.

in July. They are then from one-half to one and one-half inches in length, depending on the species. They transform to delicate whitish pupae in earthen cells within six inches of the surface of the ground. Transformation to the beetle takes place in from three weeks to a month, the beetles remaining within the earthen cell until the following spring.

Control. Clover and buckwheat are not so subject to wireworm attacks as most other crops. When these crops are grown their presence tends to decrease the number of wireworms in the field. In grass land the amount of wireworm infestation usually increases with the length of time during which the field is left in sod. An excessive wireworm infestation may be avoided by not leaving fields in grass for more than two or three years, a measure also recommended for the prevention of white grub injury and one in line with good agricultural practice.

THE ARMY-WORM

Heliothia unipuncta Haworth

Although army-worm outbreaks occur only at intervals of several years the insect is present in our meadows every season.

The army-worm caterpillars are most abundant in low, neglected meadows. Here they live in greater or less abundance and attract very little attention until some year when conditions become unusually favorable for their increase. They then become so numerous that the food supply is quickly exhausted and the caterpillars migrate in armies devouring practically every green thing in their path (Fig. 612).



FIG. 612. PASTURE DESTROYED BY ARMY-WORMS.

(Knight photo)

Under New York conditions, the army-worm passes the winter in the caterpillar stage, usually partly grown but sometimes nearly mature. These caterpillars complete their growth in the spring and when mature burrow an inch or two into the soil and there transform to brownish pupae about three-quarters of an inch in length. The spring brood of moths emerge during June. The moth (Fig. 613) has an expanse of about one and three-quarters inches. The fore wings are clay or fawn-colored and have a distinct white spot near the center. The hind wings are brownish with black veins. The female deposits her eggs in rows of from ten to sixty on the inner side of the sheath at the base of grass or

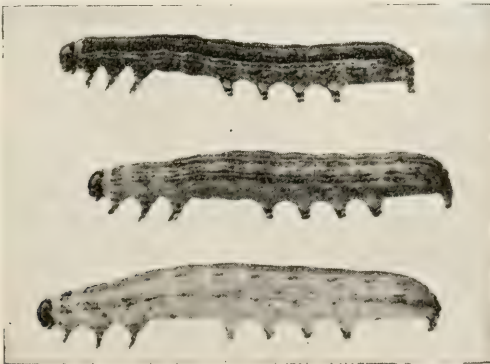
grain leaves. The eggs are covered with a white substance which fastens them together and folds the edge of the leaf around them. The eggs hatch in from six to ten days. This summer brood of



(Knight photo)

FIG. 613. ARMY-WORM MOTHS.

caterpillars is destructive during July. The full grown army-worm (Fig. 614) is about one and one-half inches in length, of a general greenish black color, much lighter below. There are several distinct stripes on each side of the body. The caterpillars of the summer brood become mature the last of July and the first of August and give rise to a fall brood of moths that appear from the middle of August to the last of September. Caterpillars hatching from eggs laid by these moths continue feeding until



(Knight photo)

FIG. 614. ARMY-WORMS SHOWING COLOR VARIATIONS.

the advent of cold weather when they go into hibernation among the roots of grasses.

Control. As a grass pest the army-worm is more likely to become injurious in fields that have been for several years in sod. Trouble may be avoided by adopting a system of crop rotation by which the land is not left in sod for more than two or three years. In case the caterpillars have assumed the army-worm habit, their advance may be stopped by plowing a furrow across their line of march with the vertical side of the furrow toward



(Knight photo)

FIG. 615. A FURROW ALONG THE EDGE OF A CORN FIELD TO STOP AN INVASION OF ARMY WORMS.

the crop to be protected (Fig. 615). Post holes should be dug at intervals in the bottom of the furrow into which the caterpillars will fall as they crawl along while attempting to climb out of the furrow. Here they may be crushed or killed with kerosene oil.

Army-worms may also be destroyed by using a poison bait made according to the following formula:

Bran, 20 pounds; paris green, 1 pound; molasses, 2 quarts; oranges or lemons, 3 fruits; water, about $3\frac{1}{2}$ gallons.

The dry bran and paris green are thoroughly mixed in a tub or similar receptacle. The juice of the oranges or lemons is squeezed into the water; the remaining pulp and peel is chopped into fine bits and added to the water. The molasses is dissolved in the water and the bran and poison wet with it, the mixture being constantly stirred so as to dampen the mash thoroughly. Only just enough water should be used to moisten the mash, but not enough to make it sloppy.

This quantity of bait will treat about three acres. The material should be scattered broadcast evenly over the infested area at night-fall. If applied during the day it dries out and is not then attractive to the caterpillars.

CUTWORMS

Several species of Noctuidae

There are several species of caterpillars closely related to the army-worm that live in grass land and which, in the aggregate, cause an enormous amount of injury. They are known as cutworms from the habit that many of them possess of eating off plants at or just below the surface of the ground. Cutworms are most abundant in old sod land and attract most attention from their injuries to crops immediately following old sod.

Cutworm injury to grass crops and to crops following grass can be in large measure prevented by not leaving land in sod for more than two or three years. When attacking other crops than grass use may be made of the sweetened poisoned bait recommended for the army-worm.

GRASSHOPPERS

Melanoplus atlantis Riley (Fig. 616), and other species

While grasshoppers are widely distributed throughout the state, they do not attract attention by their injuries except in certain years in those regions where there are large areas of sandy land. Grasshoppers are more abundant in such regions because the light sandy soil furnishes ideal conditions for the laying and preservation of their eggs.

The insect passes the winter in the egg-stage in the ground. The eggs hatch in April or May and the young grasshoppers feed on the scanty vegetation, growing in such sandy fields (Fig. 617).



(Hadley photo)

FIG. 616. GRASSHOPPER FEEDING ON
A WHEAT HEAD.

They pass through five immature stages and acquire wings at the fifth molt. Some of the grasshoppers reach maturity about the middle of June but others do not acquire wings until about the first of July. Whenever the food supply becomes exhausted the grasshoppers gradually spread out to new feeding grounds. Grasses, corn, oats, rye, clover, and other crops are often either completely destroyed or seriously damaged.

The grasshoppers continue to feed until the advent of cool weather, but egg-laying begins

the latter part of July. In depositing her eggs the female inserts her abdomen its full length into the ground. The eggs are laid in masses of from 5 to 18, arranged in several overlapping layers. The egg-mass is covered with a frothy substance which hardens and protects the eggs from moisture. Small particles of soil adhere to the egg-mass forming a curved pod

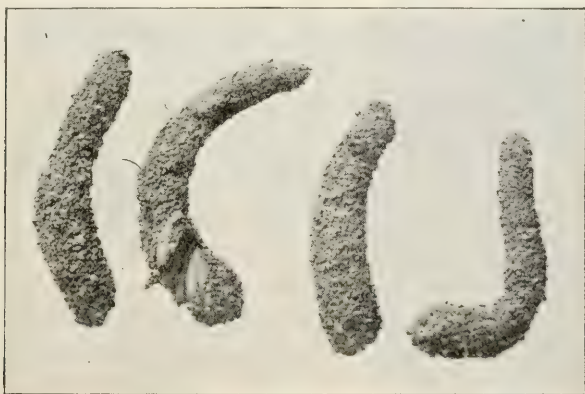


(Hadley photo)

FIG. 617. SANDY FIELD SHOWING BARE SPOTS IN WHICH
GRASSHOPPER EGGS ARE LAID.

three-quarters to over an inch in length and from one-eighth to one-quarter inch in diameter (Fig. 618). Each female usually deposits two egg-masses. The egg-laying period lasts six weeks or more.

Control. An effective and practical method of destroying grasshoppers is by the use of a poison bait as described under the army-worm. Fall and early spring plowing of the fields in which the eggs are deposited is also of great value and is the most important method of permanently controlling grasshoppers in New York. If the ground is also harrowed or disced the larger proportion of the egg-masses will be exposed to the elements and destroyed. In case it is found that a larger number of grasshoppers have recently hatched in a field it would often pay to plow the field at once in order to prevent their spreading to adjoining fields. Many of them will be buried and most of those that are not will be unable to cross the plowed land and will die of starvation.



(Hadlev photo)

FIG. 618. GRASSHOPPER EGG PODS; ONE BROKEN OPEN TO SHOW THE EGGS.

SPITTLE INSECTS

In May or June one's attention is often drawn to curious masses of froth on the stems of various grasses. If the froth is carefully removed a small greenish immature insect will be found resting on the stem. These insects are provided with a sucking beak by means of which they feed on the juices of the plant. More sap is taken in than can be assimilated by the insect. The excess is excreted at the tip of the abdomen as a thin, watery liquid; it there unites

with a sticky substance secreted by special glands and the fluid is then mixed with air and worked into a frothy mass by a pair of appendages at the tip of the body. The frothy mass is supposed to serve as a protection for the insect against its enemies. While these curious spittle insects often attract attention and provoke inquiry they really do very little harm and remedial measures are not necessary.

TIMOTHY JOINT WORM

Isosoma species

If one splits a timothy culm lengthwise he is likely to find a small white larva one-twelfth inch in length lying in the central cavity just above one of the lower nodes (Fig. 619). Sometimes the infested stems are slightly dwarfed but more often they are the largest and rankest arising from the stool. The insect really does not injure the hay crop to any appreciable extent. Timothy grass along fences and in waste places is more liable to infestation; one-year-old seeding is infested only to a slight extent.



FIG. 619. TIMOTHY JOINT-WORM
IN ITS BURROW IN A GRASS
STEM, GREATLY ENLARGED.

The insect winters in the larval state either in grass stems left along the edge of the field or those cut for hay. The insect transforms to a pupa in the stem in May and the small, black, four-winged flies emerge the last of the month. The female fly inserts her eggs in the tender stems of the growing timothy plants and the young larvae feed on the pith

just above a joint. There is only one brood annually.

No remedial measures are necessary.

DISEASES OF TIMOTHY

CHARLES GREGORY, Ithaca, N. Y.

Assistant Professor of Plant Pathology, Cornell University



In Bulletin 70 Professor Jagger has given a general discussion of the various control methods to be employed against the diseases of vegetables. These should be carefully read by the general farmer — particularly crop rotation, clean seed and seed treatment, and resistant varieties — because in these lies our only hope of controlling the diseases of the hay crops. In general, spraying is highly impracticable, if not impossible, because

of the dense growth of the crops in question and because the entire plant is later to be eaten by animals.

Although timothy is one of the most important crops, the diseases affecting it have been little studied.

SMUT

There are several grasses other than timothy on which smut, *Ustilago striaeformis* (West.) Niessl, occurs. A few of these are: red top, meadow foxtail, brome grass, orchard grass, wild rye, meadow fescues, Kentucky blue grass, and other Poas.

The diseased plants are much dwarfed. On the stems, the leaves, and sometimes on the heads, are long, black pustules or striae which contain a considerable amount of dark-brown powder, the spores of the fungus. The final result is a splitting or shredding and curling of the leaves.

The fungus lives over winter in three possible ways; namely, as mycelium in the bulbs and rootstocks of the perennial plant, as mycelium in the seed, and as spores in the old striae on the leaves and stems. Once a plant becomes diseased, it remains so.

Each year the mycelium follows up in the growing tip of the plant and produces its spores in the leaves and stems.

Since the fungus hibernates as mycelium in the seed and possibly as spores on the seed, the only feasible control measure, so

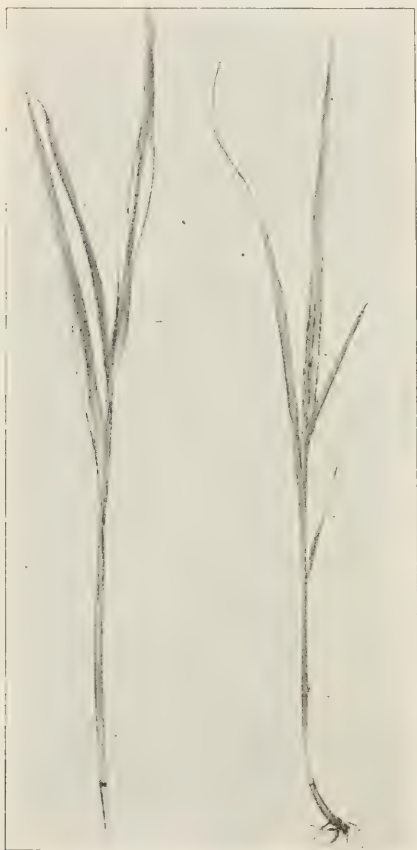


FIG. 620. YOUNG TIMOTHY PLANTS
SHOWING THE STRIAE ON THE LEAF
BLADES AND SHEATHS.

far as is known at present, is the hot-water treatment. Experiments indicate that the best method is to soak the seed 6 hours in cold water, then dip it in water heated to 52 degrees C. (126 degrees F.) for 15 minutes, or 54 degrees C. (129 degrees F.) for 10 minutes. The two conditions absolutely necessary for this treatment are that the temperature of the water remain constant and that the time of treatment be exact. More than one or two pecks ought not to be treated at once, so as to avoid too great cooling of the water when the seed is dipped and to allow rapid and ready permeation of the seed mass.

In this way all seeds will be treated uniformly. The seed may be placed in a

bag and suspended in the hot water, but the bag should be made of loosely woven cloth, like burlap, and the seed should lie loosely in it. During the treatment, the water should be continually stirred and the seed shaken from time to time.

Since this process is somewhat laborious and delicate, it is rather

a community cooperative proposition than one for the individual grower. The methods to be employed are those used in the treatment of wheat for loose smut.



FIG. 621. OLD TIMOTHY PLANTS HAVING BADLY DISEASED LEAF BLADES AND SHEATHS. IN A FEW CASES IT WILL BE NOTED THAT THE BLADES ARE BEGINNING TO SPLIT.

RUST

The rust fungus, *Puccinia Phlei-pratensis* Eriks. & Henn., occurs on the leaves, stems, and heads of timothy, meadow fescue, orchard grass, and few other grasses. The pustules are long and yellowish-brown or black. The fungus is disseminated rapidly from plant to plant by the yellow uredospores. It winters over as uredospores and teleutospores, hence it develops abundantly each year.

There is no practical control of this disease except by the development of resistant varieties. It has been shown that, in the

field, plants vary in resistance from nothing to 98 per cent. The selection of seed from these resistant plants will lead to the development of a resistant strain of the timothy. It is necessary, however, to do this locally rather than to depend on such seed sent in from some other region, because plants that are resistant in one locality may not be in another.



FIG. 622. A TIMOTHY PLANT SHOWING THE SHREDDING OF THE LEAVES DUE TO THE LEAF-SMUT.

ERGOT

Ergot, *Claviceps purpurea* (Fr.) Tul., occurs on a large number of grasses, including cereals, like rye and wheat. It is not the actual losses in the crop that make the disease important, but



FIG. 623. DISEASED AND HEALTHY PLANTS OF ORCHARD GRASS. NOTE THE EXCESSIVE DWARFING OF THE DISEASED PLANT ON THE LEFT.

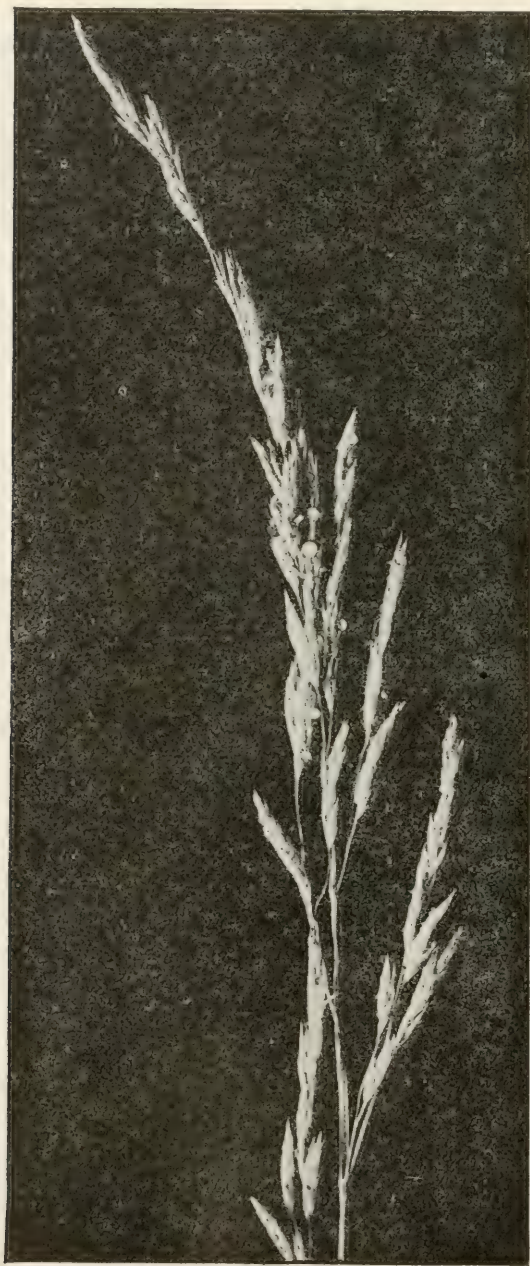


FIG. 624. A HEAD OF *FESTUCA ELATOIR* AFFECTED WITH *C. Purpurca* DURING THE EARLY STAGES OF DEVELOPMENT. NOTE THE NUMEROUS WHITE GLOBULES OOZING FROM THE SPIKELETS. THIS IS THE SO-CALLED HONEY-DEW STAGE.

the very serious effect of the fungus poison on animals. The consumption of a small amount of ergot will cause the animal disease known as ergotism or hoof-ail. Hence great care should be taken to keep the fungus from pastures and hay.

The symptoms on the grass are rather obscure in the younger stages, but become very marked later. At first a yellowish, sticky substance oozes out from between the glumes and, on drying, becomes brown. Later there will be seen long black bodies growing out in place of the grain. These are the ergots in which the poison is located.

The only control is to cut the grass before the ergots become abundant.



FIG. 625. HEADS OF ORCHARD GRASS IN WHICH A LARGE NUMBER OF BLACK ERGOTS MAY BE SEEN.



FIG. 626. THE ERGOTS GERMINATING. THESE FALL FROM THE RIPE HEADS OF THE GRASS TO THE GROUND AND WILL GERMINATE IN THIS WAY IN THE SPRING. THE SPORES ARE PRODUCED IN THE GLOBOSE HEADS AT THE ENDS OF THE STALKS.

LEAF STREAK OR BLIGHT

Leaf streak or blight, *Scolecotrichum graminis* Fekl., causes leaf spots, which are at first reddish-brown to purple, finally becoming ashen in the center. The spots may involve all or only a portion of the leaf. It may become exceptionally severe on timothy and orchard grass. The life history of the fungus is not known and no control has been devised.

SEEDING TIMOTHY WITHOUT A GRAIN CROP*

EDWARD VAN ALSTYNE

Director of Farmers' Institutes



What I have to say on this subject relates wholly to land best adapted to hay, not to cases where the crop is grown in a short rotation chiefly for the benefit obtained from the clover,—which unfortunately often fails to materialize—under which conditions a grain crop will usually give a greater return. I have a number of acres of this kind of land. I have also many acres of natural grass land on which hay pays better than any other crop. On

such land I have found it much better to seed with grass alone rather than in combination with a grain crop. There is no question but that on this kind of land an acre of hay will return a larger net income than an acre of wheat or rye, both of which will require much more labor and expensive machinery.† In such cases, unless the straw is needed on the farm, I can see no object in growing the grain as a money crop; furthermore, no land will give as high yields of hay where a grain crop has eaten at the first table.

In seeding with spring grain, such as oats or barley, there is an advantage in the labor saved, an item not to be ignored. Nevertheless, if hay is the object, an extra fitting and seeding, as I shall outline, will give ample return for labor expended. What I shall say is based on personal experience; hence I may be excused from what may seem too much of personal method, as this is a sort of heart-to-heart talk, or experience meeting.

My experience in seeding with spring grain has been very unsatisfactory. There are likely to be a good many weeds,

*Address given at Farmers' Day Meeting, Fort Edward, March 22, 1916.

†This statement would not be true with present war prices for grain. Nevertheless, under normal conditions it is good advice.

which prevent the growth of grass and later spoil the hay. If the season is at all dry, the moisture and plant food taken by the grain in midsummer usually results in a poor seeding.

Few farmers appreciate the possibilities of an acre of hay when grown according to the laws of grass. Clark, of Connecticut, though working on a small scale, and in many things impractical, did demonstrate these possibilities and thereby conferred a boon on hay growers.

PERSONAL EXPERIENCES

On the hay land referred to, I tried various methods of seeding. When sown with spring grain either "the weeds sprang up and choked the seed," or "when the sun arose it withered away because it had no depth of root." Then I tried winter grain, which was better so far as the seed was concerned; but, when I put the land in condition to grow a large crop of grass, the grain lodged and failed to fill, and the Christianity of the man who ran the binder was sorely tried. The failure of a wheat crop through freezing out, and the late but fine crop of grass instead, led me to ask the question, "Why the grain crop at all if one can



FIG. 627. A TIMOTHY CROP IN COLUMBIA COUNTY. THREE TONS TO THE ACRE, SECOND YEAR'S CUTTING. SOWN WITHOUT A NURSE CROP.

get such good grass after the wheat has occupied the first place during the fall? Would there not be even a better crop when grass has sole possession of the field?" More than fifteen years' experience since has justified my conclusion.

PRESENT-DAY ROTATION

These hay lands I keep in grass as long as they will cut a profitable crop, one ton per acre being the minimum. The average stand is five years, yet I have held them thirteen. After being broken, the land is planted to corn, commercial fertilizer being used. Following the corn, whenever possible, the land is plowed in the fall, and the oats are sowed as early in spring as possible. The oat crop is needed for both the grain and straw. With the oats I sow from 200 to 300 pounds of acid phosphate to the acre; this increases the yield and hastens maturity, the latter being very important in order to get the land properly fitted after the oats are off. The stubble is cut high in order to supply humus.

FITTING THE SOIL

As soon as the oats are removed, plowing is begun. I have found this method more satisfactory than to fit without breaking. The land is plowed at least eight inches deep, a jointer being used to take off the edge of the furrow and to turn under the stubble. It is very important that a lap furrow be turned; this leaves the stubble between the furrows where it will quickly decay and help to hold moisture. The stubble should not be put in the bottom of the furrow where it will be a long time decaying, and will prevent the rise of water from the subsoil. This, too, is very important, as is the immediate going over of the land with a harrow, plank drag, or roller. The former should be used if the land is wet; either of the others according to the dryness, in the order named. After this the cutaway is employed until seeding time. Three or four fittings with an interval between will be much more effective than to put on all of this work at one time. The ground is thus made solid, evaporation is prevented, the connection between the subsoil and the bottom of the furrow is established, weeds are killed, and the land is made fine and mellow.

FERTILIZING

Nothing does more to insure a crop after thorough fitting than a dressing of stable manure. Six or seven tons an acre, applied with a spreader, will do wonders. With this, I use 350 pounds an acre of a fertilizer made up of nine parts of acid phosphate to one of muriate of potash. For the past two years, the latter has been unobtainable, and the acid phosphate has had to suffice. Manure is not always available, of course, and, this failing, I have found the following mixture to serve well: 500 pounds of nitrate of soda, 500 of high-grade tankage, 800 of acid phosphate, and, when obtainable, 200 pounds of muriate of potash — applied at the rate of 500 pounds to each acre. One thousand pounds of burned lime or 2,000 pounds of ground limestone to the acre has always given marked results, even with timothy. I can stand on my lawn today and look over a field a quarter of a mile away and see in the stubble where the lime stopped, as plainly as though a line had been drawn across the field. The lime should be applied immediately after plowing, and should be thoroughly incorporated with the soil.

SEEDING

Seeding should be done the last week in August or the first in September. I have had a splendid stand from seed put in as late as September 20 when conditions were favorable, but ordinarily this is too late. Much depends on the rainfall and the condition of the soil. Certain it is that it is unwise to seed until the land has been compacted and the surface made fine; this is vital in a dry season. I have had but two failures in fifteen years; both of these occurred when the seed was sowed before the land was made firm.

I use fourteen quarts of the best timothy and two of reeleaned redtop. The latter amount will not harm the quality of the hay — more will — and will materially increase the yield to the acre. This is thick seeding, but my object is to have every inch of ground covered by a grass plant, thus preventing, to a great extent, the growth of weeds. My heaviest yields of hay have been from a thick stand on the bottom, rather than from tall grass not so close. I have sowed about two quarts of alsike at time of seeding, or in the spring; at both times it has given good results.



FIG. 628.—SEVENTH YEAR SEEDING WITHOUT A GRAIN CROP. THREE TONS OF CURED HAY PER ACRE. FARM OF EDWARD VAN ALSTYNE, KINDERHOOK, N. Y.

While the alsike adds to the volume and to the feeding value of the hay, it detracts from the selling value, and on rich land is likely to remain for several years. When the hay is grown for city markets, I find it better to leave out the alsike.

We put half of the seed in the drill with the fertilizer; this saves labor. The other half is sown the opposite way with a weeder, seeder, or by hand, whichever is most convenient. In the latter case, a slant-tooth harrow is used to cover the seed and fine the land; then the roller — one with a corrugated surface — is best.

CONCLUSION

"A lot of work," someone says. Yes, a little more than with a winter grain crop properly put in, but the results justify the expense. I could tell, and have my statements verified by my neighbors, of some marvellous crops; suffice to say that we expect and obtain at the first cutting fully three tons to the acre of clean, first-class hay. In years like the past, of abundant rainfall, we sometimes cut a second crop, but usually it is wiser to let this go back as humus. Such a crop nets more than an acre of wheat or rye and is more certain, since there is little danger of winter-killing. Also, the meadow can be held fully a year longer than if the seed had been put in with a grain crop. By the application of commercial fertilizers, as described on page 2768, a profitable yield can be maintained, and the life of the meadow prolonged. When manure is at hand, we top-dress the third or fourth year. In a word, this is the Clark method brought down to farm practice.

FERTILIZERS FOR TIMOTHY

ELMER O. FIPPIN, Ithaca, N. Y.

Professor of Soil Technology, Cornell University

The fertilization of the soil for timothy follows no simple, fixed rules any more than does the fertilization of any other crop. In deciding on the need of the plant for applications of nutrients, many factors must be taken into account, such as its composition, habit of growth, root system, and physiological properties. In addition, the soil has certain characteristics that vary in different places. The fertilizer for timothy should be selected in view of the requirements of the plant and also with due consideration for the properties and composition of the soil on which the crop is to be grown. The fertilizer that gives best results in one place may not give best results on a different soil or on the same soil that has been differently treated. At the same time the characteristics of the plant suggest the main line of treatment.

CHARACTERISTICS OF THE TIMOTHY PLANT

Timothy hay is a nonlegume. As a forage plant, it is expected to make a large, leafy, vegetative growth. Such a growth draws heavily on nitrogen, and a generous supply, therefore, promotes vegetative development and leads to the formation of loose, soft tissues and large green weight. If other conditions are favorable, there is a corresponding gain in total dry weight. In New York, the crop matures for hay about the first of July and makes an early spring growth. This period is in advance of the largest development of nitrates in the soil. In addition the further fact must be considered that the plant is a grass and is therefore dependent on available nitrogen compounds in the soil. These points would indicate the relatively large importance of readily available nitrogenous fertilizer.

Phosphorus, potassium, lime, and sulphur cannot be overlooked, however, because the plant makes a corresponding draft on those constituents. Rather woody stems are formed toward maturity

that call particularly for potassium and lime and the elaboration of starch, sugar, and fat constituents. These contribute to the feeding value of the plant, which is largely dependent on those elements of food. Phosphorous, which enters most largely into the seed and is absorbed most actively towards maturity, especially when the seed begins to form, is also required in the vital activity of every living cell and is particularly effective in promoting the large development of the root system. This element cannot be overlooked, therefore, if there is any possibility of a deficient supply from the soil.

In addition, enough alkaline material to keep the soil in the neighborhood of a neutral reaction is also essential. The plant will not tolerate a strongly acid condition although it will thrive on a soil containing less lime than is essential for red clover.

COMPOSITION OF TIMOTHY HAY

As reported in the various analyses the composition of the timothy plant differs as does the composition of every other plant, according to the character of the soil, the conditions of growth, and the stage of maturity. These variations should always be kept in mind in examining figures on composition, since the variation may be as much as 50 per cent from the average for the same stage of development.

The following table gives the composition of the plant in percentage and in pounds on each acre for a yield of two tons of dried hay carrying from 10 to 12 per cent of moisture:

TABLE I
COMPOSITION OF TIMOTHY HAY

	Moisture	Nitrogen	Potassium	Phosphorus	Sulphur	Calcium	Magnesium	Sodium
Composition of timothy hay in percentage....	10	0.95	0.8	0.18	0.12	0.2	0.1	0.35
Pounds for each acre with yield of two tons....	400	38.00	32.00	7.2 (Phosphoric acid)	4.8	8.0	4.0	14.00
Equivalent....	....	(Ammonia) 45.00	(Potash) 38.5	16.00		Lime 18.00		

As compared with legumes, timothy does not make a heavy draft on nitrogen, the former crops using from two to three times as large a proportion. The fact must be considered that timothy is not a legume and, therefore, cannot secure its nitrogen direct from the atmosphere through the aid of bacteria in nodules on the roots.

TIMOTHY INTERFERES WITH NITRIFICATION

Another point to be considered is the fact that the roots of timothy interfere with the formation of nitrates in the soil.* The investigations of Lyon and Bizzell indicate that timothy, more than any other crop commonly grown on the farm, interferes with the formation of nitrates. This interference extends beyond the time when the crop has been cut and the roots plowed under. The effect extends to the nitrification of materials added to the soil, such as dried blood. This means that nitrogen fertilizers for timothy should be very largely in forms immediately available to the plant. It also suggests the importance of available nitrogen fertilizers on crops growing with timothy, such as orchard trees.

NITROGEN FERTILIZERS ESSENTIAL

In view of the facts presented, it may be laid down as a general proposition that nitrogenous fertilizers are particularly beneficial to the timothy crop. If the soil is not heavily stocked with organic matter and in an active condition, the use of some form of nitrogenous fertilizer will largely increase the yield. This point may be considered in connection with the statement in the article on "Soils for Timothy" (page 2738), namely, that the soils of swamp and muck and those of recent alluvial origin are best suited to the production of the crop.

EXPERIMENTS AT CORNELL UNIVERSITY

Investigations and experience show that the crop will respond to any of the soluble forms of nitrogen. The use of mineral forms has been extensively practiced. For ten years a series of plots devoted to timothy for three-year periods in rotation with corn, oats, and wheat one year each, has been in progress at the

* Lyon, T. L. and Bizzell, J. A. (1913). Some relations of certain higher plants to the formation of nitrates in soils. Cornell University Agr. Exp. Sta. Memoir No. 1, 1913.

Cornell Experiment Station on the silty Dunkirk clay loam, which was originally rather low in organic matter and nitrogen. The primary part of the study has been the effect of fertilizers applied to the timothy on succeeding grain crops. The unit application of fertilizers is as follows: 160 pounds nitrate of soda, 320 pounds acid phosphate, 80 pounds muriate of potash, 10 tons stable manure. In the columns headed "nitrogen," "phosphorus," and "potassium," in the table below, the unit amount of fertilizer just mentioned is represented by "1," while "2" indicates twice that amount.

These materials are used on the twenty-two tenth-acre plots in different combinations and different amounts.* The following table gives a summary of the results:

TABLE II
EFFECT OF FERTILIZERS ON TIMOTHY

Number of plot	Fertilizer treatment			First three years in hay			Second three years in hay		
	Nitrogen	Phosphorus	Potassium	Total pounds to each acre	Percentage increase	Value net gain 3 years	Total pounds to each acre	Percentage increase	Value net gain 3 years
712	0	1	0	4,233	21.9	\$5 56	3,143	8.1	\$1 76
713	0	0	1	4,490	30.8	12 26	3,123	6.0	1 93
715	1	0	0	4,530	38.9	8 41	4,717	65.6	20 36
716	1	1	0	4,797	53.5	8 90	4,443	68.2	11 56
718	0	1	1	4,127	34.2	6 88	3,393	37.8	4 64
719	1	0	1	5,127	69.8	18 52	4,643	95.1	21 95
721	1	1	1	5,700	85.5	23 91	4,970	127.3	24 10
722	1	2	1	5,270	71.8	6 89	4,913	139.6	18 60
724	2	2	1	6,923	128.2	24 71	6,140	225.6	18 67
725	2	1	1	7,103	145.1	36 24	6,073	222.6	36 14
727*	2	1	1	6,223	135.8	†36.72	6,383	237.4	37 01
728	4	1	1	6,073	†184.5	†25 62	6,230	224.2	8 46
731	10 tons manure			5,093	254.5	23 55	5,050	252.5	23 09
732	20 tons manure			7,293	364.6	33 15	7,057	352.8	31 14

* Different treatments during part of period.

† Based on two years' data.

‡ Average for two years.

The data here presented show that chemical manures will largely increase the yield of timothy. These fertilizers were

* Cornell Agr. Exp. Sta. Buls. 232, 241, 261, 273, 339. These bulletins report the results of the timothy fertilizer experiments from time to time.

applied broadcast as a top-dressing on the sod each spring about the time growth started, April 10 to May 1. No fertilizer was applied to the grain crops that intervened between the two periods of timothy.

These results show that under the soil conditions here prevailing nitrogen is most effective to increase the yield. On this soil nitrogen alone as nitrate is not effective to maintain the yield from year to year. These results are supported by the experience of farmers that nitrogen alone will often give a large increase in hay the first year, but a decrease in succeeding years. This, of course, is related to the need for other elements. The use of nitrate alone would be advisable on an old sod that is to be plowed up the next season.

The mineral elements, phosphorous and potassium, alone have a relatively small effect that dwindles with the lengthening of the period of growth. It should be remembered that the soil is naturally well stocked with total phosphorous and potassium. When coupled with the mineral elements, the effect of nitrogen is cumulative and is greater in the second than in the first period.

Doubling the phosphorous on this soil appears to decrease the yield, although the result in the second period shows some doubt on that conclusion. On most soils in the state it is not believed any such effect need be anticipated. There is a regular increase in yield with increase in the nitrogen added along with a standard amount of minerals. This increase appears to be cumulative, as it is greater in the second than in the first period. As a result of the fertilizer treatment, a normally larger development of roots and stubble leaves a larger residue of organic matter, which has a double effect on the soil and the crop, as will be explained later.

GENERAL FERTILIZER SUGGESTED FOR TIMOTHY

As a result of this and other data, a commercial fertilizer top-dressing to be applied in early spring is recommended for timothy meadows. As has been indicated, the best mixture will vary with the soils, but for the average upland deficient in organic matter the following mixture is suggested: nitrate of soda 200 pounds, acid phosphate 100 pounds, muriate or sulphate of potash, 50 pounds. The suggestion of potash is based on normal prices that prevailed

before war conditions developed and should not be included at present prices.

This mixture is particularly effective to increase the growth of established timothy meadows. Many farmers have tried out the treatment on different soils and have found it profitable. As an example may be mentioned a field purchased by Cornell University and made up of the same grade of clay loam as that on which the experiment is conducted.* The field of six acres has been cut three years and was giving a yield estimated at one and one-fourth tons. The foregoing fertilizer treatment gave yields as follows:

1910.....	3.34 tons
1911.....	2.62 tons
1912.....	3.00 tons
1913.....	2.86 tons

MANURE AS A FERTILIZER FOR TIMOTHY

In Table I, the largest increase in yield is produced by stable manure and is to some degree proportionate to the application. The net return is not so large as that from a complete fertilizer with a double application of nitrogen because of the large cost of the material. This was rated at \$1.50 a ton on the land, which is not an unreasonable figure. The manure added every two years would carry a quarter more nitrogen and potassium than the fertilizers for the three-year period. The result bears out the statement above, that with a moderate supply of minerals the yield is roughly proportionate to the nitrogen applied. The same result was secured at the Ohio station, where timothy appears in a five-year rotation preceded by clover. At the Massachusetts station, a 4 per cent larger yield of timothy with some clover was secured from a spring application of manure, which had stood in a pile during the winter, than from fall and winter applications. The result is not conclusive, since only one year's yield is reported. In practice, under average conditions, such a result is hardly to be expected.

Many farmers have realized from experience the profits to be derived from the use of manure on their new grass seeding rather than on old sod for grain. In the experiment at Cornell University mentioned previously, an application of the manure to the

* E. G. Montgomery, Cornell Reading Course, Bul. No. 65. Meadows in New York.

hay increased the grain nearly as much as when applied to the old sod and also gave a larger net profit. The root residues from the sod have a very considerable value.

ORGANIC FORMS OF NITROGEN DESIRABLE

There is some indication that nitrogenous fertilizer in organic form is congenial to the timothy plant. Whether there is a specific preference for organic nitrogen does not appear to have been studied. That the timothy plant will use organic nitrogen compounds is suggested by the effect of legumes growing with timothy on its composition and yield. At the Cornell station,* it has been found that legumes, in general, largely benefit the nonlegume with which they grow by supplying available nitrogen. Timothy grown with alfalfa had from $\frac{2}{3}$ to nearly 3 per cent more protein than when grown alone. When grown with red clover, it had 7 per cent more protein. When oats were grown with field peas there was not only an improvement in composition, but the yield was increased by about one-third over the oats alongside, without association with peas. Although no figures are at hand, observations suggest the same relation of timothy to clover.

These data, together with the fact now well established that plants do use their nitrogenous, as well as nonnitrogenous, food in the form of rather complexly organized organic compounds, suggest the importance of keeping the soil as largely stocked as possible with fresh, actively decaying organic material, whether it be from organic fertilizers, stock manure, or leguminous stubble.

Dr. I. P. Roberts† suggests from his wide range of observation the importance of keeping clover plants among the timothy to feed the latter on the decay of the clover plant. Certainly, in so far as possible, the maintenance of a moderate stand of leguminous plants with the timothy, especially at the start, is to be recommended for the largest total yield of hay. The net returns from the quadruple application of nitrogen as nitrate of soda, given in Table II, shows that while the total yield increased, the profit decreased over a double application. Of course, the exact amount

* Cornell Agr. Exp. Sta. Bul. 294. T. L. Lyon and J. A. Bizzell. A heretofore unnoted benefit from the growth of legumes.

† Cornell Agr. Exp. Sta. Bul. 280, (1910). Pastures in New York.

of nitrogen or any other element that will give most profitable returns can be determined only by trial in the particular field.

FERTILIZERS ON THE NURSE CROP

The use of commercial fertilizers and manure on the nurse crops for grass must be practiced with great caution. As a general principle, it may be stated that applications that bring the nurse crop up to a medium stand are likely to be beneficial to the grass seeding; but applications beyond that, or where the growth of the nurse crop is already good, are likely to benefit the nurse crop at the expense of the grass seeding. A moderate application of fertilizer with the grain at seeding time, especially in fall, is likely to help in maintaining the stand of plants against the exigencies of winter.

LIME NEEDED BY TIMOTHY

On many soils, lime has a beneficial effect on timothy. At both the Cornell and Ohio stations, lime showed marked benefit to timothy on soils requiring liming for legumes, but timothy is rather less sensitive to a shortage of lime than is red clover or alfalfa. No data are at hand showing any distinction between the caustic or carbonate forms of lime for timothy. The amount to be applied must, of course, be related to the soil. It should be applied in advance, preferably to a tilled crop, to insure its deep and thorough incorporation into the soil.

IMPORTANCE OF THOROUGHLY FITTING THE SOIL

As a final word the importance of having the soil in good physical condition, well stocked with organic matter and well supplied with available plant food to a considerable depth, cannot be too strongly emphasized. While top-dressing gives marked benefit, the incorporation of the fertilizer with the soil is still better; the system of farming must dictate the practice in this matter. Thorough fitting is possible where the grass mixture is seeded alone.

Thorough tillage of the soil also contributes its mite. In a very literal sense, "Tillage is manure," and it is especially the sanitary agent that puts the soil in a fresh, healthy condition through thorough aeration. The Clark method, which has been effective to obtain enormous yields of grass in which timothy was

dominant, puts heavy emphasis on deep and very thorough fitting, along with heavy fertilization and heavy seeding.

The key of these lines of treatment is the large draft a good yield makes on nitrogen and the peculiar relation the plant bears to that element.

SUMMARY

The points in the fertilization of timothy may be summarized as follows:

The soil should be heavily and deeply stocked with organic matter.

Nitrogenous fertilizers, especially those of an organic nature, should be used.

Stable manure will usually give more profit applied to the established timothy meadow than to the old sod for corn.

A mineral nitrogen fertilizer alone is not likely to maintain the yield.

A small amount of mineral elements — phosphorous and potassium — aids the nitrogen to maintain or increase the yield. Mineral elements alone are not effective unless the soil is rich in organic matter.

Top-dressing established fields in early spring with a complete commercial fertilizer is often profitable.

Legumes growing with timothy are desirable from the viewpoint of yield and composition wherever practicable.

Timothy responds to lime on some soils, especially those deficient in organic matter.

Thorough fitting of the seed bed and deep incorporation of the fertilizer are very effective in increasing the yield.

BARNYARD MANURE ALMOST DOUBLES THE HAY CROP

In August, 1916, the *Montgomery County Farm Bureau News* printed the following:

In the town of Mohawk, Montgomery County, Stanley Everson carried on a field test to determine the value of stable manure in top-dressing hay fields. Last fall after oat harvest, he top-dressed a portion of a field of new seeding at the rate of eight loads of stable manure to the acre, applied with a manure spreader. The field was mowed on July 19, and on July 20 the farm bureau manager assisted Mr. Everson in taking weights of production on equal areas where manure had been applied and where no manure was applied, to determine the amount of increased yield of hay due to the application of manure.



FIG. 629. COMPARATIVE RESULT OF FIELD TEST ON FARM OF STANLEY EVERSON, MONTGOMERY COUNTY.

Where the manure had been applied the yield of hay was 7,184 pounds per acre; while in the same field, with quality of soil and seeding equally as good, the yield without manure was only 3,840 pounds. Eight loads of stable manure per acre gave an increased yield of 87 per cent.

Mr. Everson makes a practice of hauling manure direct from the stable to the field, whenever practicable. He believes in getting his stable manure on the ground as quickly as possible, to grow increased crops, to feed more stock, to make more manure, to grow more crops.

COST OF PRODUCTION OF TIMOTHY AND CLOVER HAY ON SOME NEW YORK FARMS

(The following article is taken from Cornell Bulletin 377 — Cost Accounts on Some New York Farms, by C. E. Ladd, Instructor and Investigator in Farm Management.)

In its climate, soils, and markets, New York State is well adapted for hay production. Nearly all the farms in the state raise hay. Of the total area in crops on cooperating farms, 38 per cent in 1912, and 34 per cent in 1913, was in timothy and clover. This percentage varied from 9 to 62 on individual farms. Only one farm with which accounts have been kept did not raise timothy and clover; this farm raised alfalfa. On several farms the hay account included small fields of alfalfa or oat and pea hay. These farms were not included in the tabulation. The average yield of timothy and clover hay for New York State was 1.25 tons per acre in 1912, and 1.14 tons per acre in 1913.* The average yield on the cooperating farms was slightly higher than the average for the state. One farm had an average yield of 2.5 tons per acre, while on one farm the yield was 0.66 tons per acre. Both these farms, however, made a profit in producing hay.

The data concerning the production of timothy and clover hay are given in the following table. Very little of this hay was marketed during the year.

AVERAGES FOR TIMOTHY AND CLOVER HAY

	1912	1913
Number of farms.....	12	23
Total number of acres.....	487.5	823.7
Total yield in tons.....	679.5	1185.9
Yield per acre in tons.....	1.39	1.44
Value per acre.....	\$15.53	\$16.34
Cost per acre.....	12.58	12.31
Profit per acre.....	2.95	4.03

* U. S. Agr. Dept. Year book 1913:418.

AVERAGES FOR TIMOTHY AND CLOVER HAY—Continued

	1912	1913
Value per ton.....	\$11.15	\$11.35
Cost per ton.....	9.03	8.55
Profit per ton.....	2.12	2.80
Profit per man hour.....	\$0.27	\$0.37
Man hours per acre.....	11.03	10.80
Horse hours per acre.....	10.50	10.25
Cost per acre aside from marketing.....	.....	\$12.11
Cost per ton aside from marketing.....	.....	8.41
Man hours per acre aside from marketing.....	.....	10.17
Horse power per acre aside from marketing.....	.....	9.74

The value per ton used in the computation is in most cases farm value, and includes each year some hay of poor quality inventoried at \$8.50 or \$9 a ton.

Only five farms showed a loss on the hay account. One farm with a yield of 1.8 tons per acre made a profit of \$8.75 per ton. Fourteen farms made a profit per man hour of 50 cents or more.

The number of man hours per acre varied from 5.76, on a farm that harvested 100 acres with an average yield of only 1 ton per acre, up to 21.5, on a farm with a yield of $1\frac{1}{2}$ tons per acre. The latter farm was also very rough and hilly, and its hay was distributed in several small, rough, irregular fields. The number of horse hours on these two farms were 7.52 and 14.53, respectively.

In 1913, of 1185.9 tons of hay raised, 78.7 tons were marketed during the same year. Some was held for sale later. The cost of production was separated from the cost of marketing. The use of buildings was charged as a cost of production. All time and charges beginning with the pressing of the hay or the removal of the hay from the mow, and including delivery to car or market, were charged to cost of marketing.

Most of the hay was sold on the understanding that the buyer should pay for the pressing. All marketing costs were figured on this basis and do not include the cost of pressing. In most cases

the farmer furnished the men to pitch the hay to the press. The cost of marketing this hay is shown in the following table:

COST OF MARKETING 78.74 TONS OF HAY, 1913

Man hours per ton.....	6.54
Horse hours per ton.....	5.21
Average haul in miles.....	3.00
Man labor cost per ton.....	\$1.14
Horse labor cost per ton.....	0.72
Equipment cost per ton.....	0.23
Total cost per ton.....	\$2.09

The average distribution of the cost of producing hay in 1912 and in 1913 is shown in the table below.

The hay crop has a smaller proportion of its total cost in labor than has any other crop grown on these farms. Labor (man, horse, and equipment) amounted to over 30 per cent of the total cost. Use of land, and manure and fertilizer, were the next most important costs.

AVERAGES FOR HAY

	1912		1913	
	Average cost per acre	Per cent of total cost	Average cost per acre	Per cent of total cost
Seed.....	\$0.98	8	\$1.07	9
Fertilizer and manure.....	3.03	24	2.78	22
Man labor.....	1.67	13	1.80	15
Horse labor.....	1.70	13	1.47	12
Equipment labor.....	0.58	5	0.51	4
Use of land.....	3.61	29	3.67	30
Use of buildings.....	1.00	8	1.00	8
Miscellaneous.....	0.01		0.01	
Total cost.....	\$12.58		\$12.31	

HARVESTING THE HAY CROP

H. B. McCLURE

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TIME TO CUT HAY



Hay should be cut when the greatest quantity of that which is palatable can be secured per acre. Unfortunately, however, there are factors that often prevent this; namely, rainy weather, necessary work on other crops, and an insufficient amount of help. The latter applies particularly to farms growing a considerable acreage of hay.

Timothy should be cut when just coming into full bloom to secure the largest amount of nutrients and yield. Hay cut at the beginning of the blooming season is much more difficult to cure than that cut after the seeds have formed and the plant is getting "ripe."

TIME OF DAY TO CUT

On the average eastern farm where a comparatively small acreage of hay is grown, it is the custom to haul in hay during the afternoon only. If the weather is favorable, hay cut in the afternoon and put into the barn the next afternoon will produce a crop having an excellent color, and without overexposure to the sun. The objection to this method is that cutting in the afternoon requires one more man and team than when the cutting is done in the morning. The amount of hay cut down at any one time should never be more than can be handled in one day; or, in other words, the mower should be only one day ahead of the crew putting the hay into the barn.

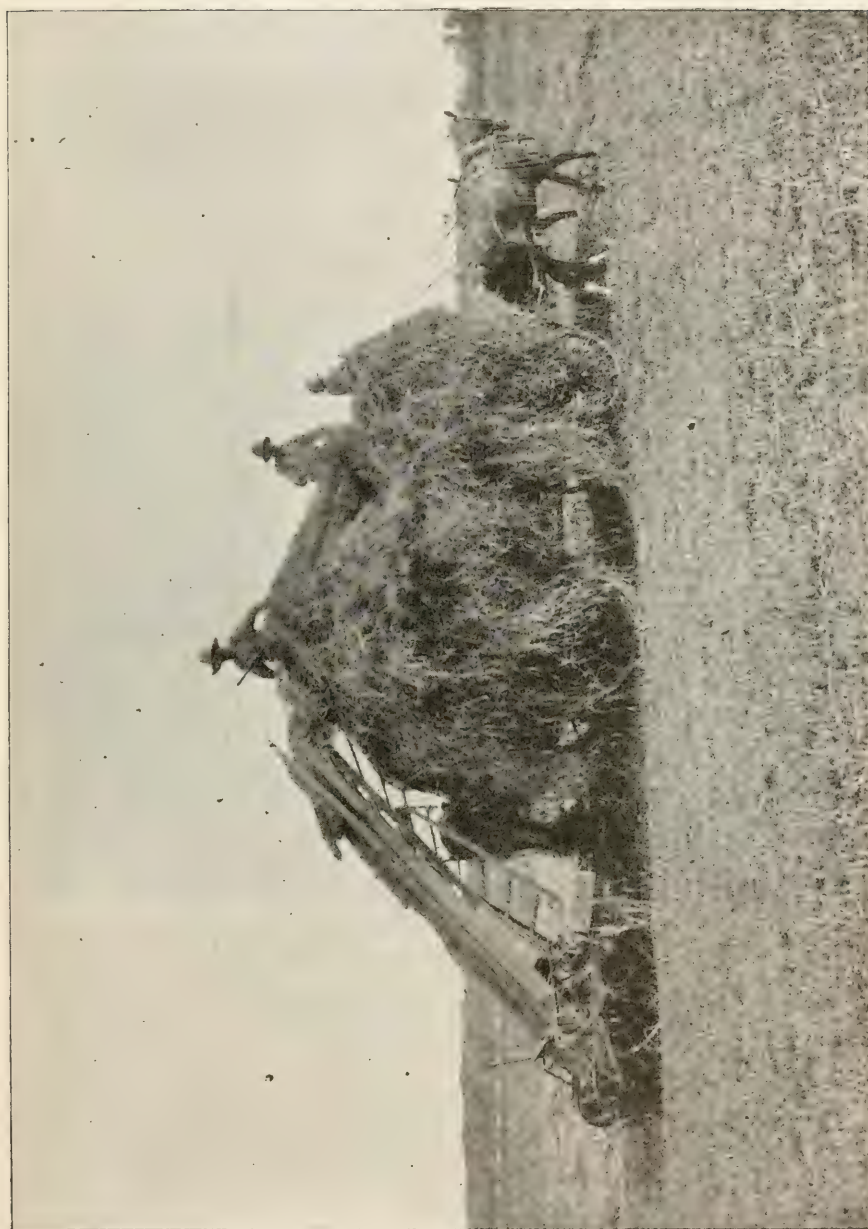


FIG. 630. TWO MEN AND A BOY CONSTITUTE THE CREW WHEN HAY LOADER IS USED.

MACHINERY FOR EASTERN CONDITIONS

Mower

The size of mower needed should depend somewhat on the amount of hay to be cut per day. Roughly speaking, a five-foot mower will cut 10 acres per day of 10 hours; a six-foot mower will cut 12 acres, and a seven-foot mower, 14; or, in other words, a mower will cut two acres per lineal foot per day. This will vary somewhat, depending on the size of the team and the character of the ground, as well as on the yield and variety of grass.



FIG. 631. BRINGING IN HAY WITH A SWEEP-RAKE. THE HORSES DO ALL OF THE HEAVY WORK.

When the five-foot mower is used, it is often necessary to employ a second mower at least part of the time in order to cut the desired quantity per day — a necessity that might be obviated by the use of one seven- or eight-foot mower.

Loaders

The hay loader, Fig. 630, if properly used, saves time and gathers in the hay faster than pitching it on by hand. To attain the most efficient use of a loader, the men on the wagon should be prepared to work and work hard; this is not a lazy man's job. Investi-

gations have shown that when the farm owner works on the wagon, more hay will be handled per day than when hired help work alone, as is also true when the pitching is done by hand.

If two men work together — one taking the hay from the loader, the other driving and placing the front corners — and change places every other load, the work is no harder than continuous hand pitching.

Sweep-rake

It is believed that the sweep-rake, Fig. 631, can be used advantageously under certain conditions. If hay is to be stacked in the field, the sweep-rake and stacker will be found to be the most



FIG. 632. LOADING ONTO A WAGON BY HAND, ONE OF THE OLDEST AND MOST EXPENSIVE METHODS IN COMMON USE.

efficient implements for putting up hay. The sweep-rake may also be used to bring hay to the barn, provided the haul is not over a quarter of a mile, the ground is not too rough, and the barn has gable doors large enough to allow the use of the hay sling.

CREW MANAGEMENT

The season during which a good grade of tame hay can be harvested is short at best, and is often shortened by rainy weather

and other farm work. When the farmer has a chance to make hay, he should arrange his crew so that it will work to the very best advantage. There is a considerable difference in the quantity of hay that crews of the same size will put up in a day. A comparison of two small two-man crews will illustrate this and show the value of the loader.

Crew No. 1

Crew No. 1, Fig. 632, is composed of two men and four horses. After the first day, one man and team mows from nine until twelve, cutting down three acres, or four and a half tons. The other man starts tedding at eight o'clock and by noon has teded and raked the hay that was cut the day before. In the afternoon, starting at one o'clock, both men begin hauling, one man pitching on the wagon with a hand fork and the other building the load. Both go to the barn and unload. The second team is used only to haul hay up into the mow in the afternoon. This crew will cut, ted, rake, and put into the barn three acres, or four and a half tons per day. Total man-hours, 17; horse-hours, 34; cost for labor (man-labor, \$0.15, and horse-labor, \$0.08, per hour), \$1.17 per ton.

Crew No. 2

Crew No. 2, Fig. 633, is composed of two men and four horses. By using a side-delivery rake and hay loader, they will cut, rake, and put into barn six acres, or nine tons per day.

One man and team mows from seven-thirty until noon, cutting down six acres. The second man does not work in the hay in the forenoon. In the afternoon, one man rakes with the side-delivery rake while the other man puts on a load with the loader, the team needing no driver. By the time the first load is on the wagon, two loads have been raked. Both men go to the barn to unload, one working in the mow and the other sticking the fork and driving the team to hoist the hay. The team on the rake is left standing in the field while the hay is unloaded. Both men work on the wagon putting on the second load. The third and every other load thereafter is put on by one man, the other raking. The men change places every other load. Total man-hours, 16.5; horse-hours, 33; cost per ton, \$0.56.

It will be noted that the man and horse-hours are practically the same for each crew, while the cost of labor is just about half when the loader is used. The main point to be remembered is that this is a short-handed crew, and both men work hard, doing more than the average crew. When there is plenty of help, this crew will consist of three men and one boy. One man rakes from one until three o'clock; two men load the hay, and the boy drives the team while the load is being put on. The man-hours (counting boy-labor as one-half a man's labor) amounts to 22.5 hours and horse-labor to 27 hours per day, making the cost per ton for labor \$0.61 per ton.



FIG. 633. RAKING WITH SIDE-DELIVERY RAKE. A GOOD IMPLEMENT TO USE, AS LITTLE TIME IS LOST BY THE HAULING CREW WAITING FOR ENOUGH TO BE RAKED TO START HAULING. AS THE HAY IS LEFT IN AN ELEVATED WINDROW, IT DRIES MUCH FASTER THAN WHEN IN THE SWATH, OR WHEN RAKED WITH A DUMP RAKE.

Crew No. 3

Crew No. 3 consists of three men and four horses. This is a very common method in the Central States and is recommended where the hay area is not over 60 acres. The hay is pitched on the wagon by hand. One man mows from 8:30 until noon; the second rakes from 9:30 until noon. The third man does not work in the forenoon, but can plow corn or do other farm work.

In the afternoon two men pitch onto the wagon by hand, the third building the load. At the barn one man works in the mow, one on the wagon, and the third drives the team to hoist. This

crew will put up six tons per day. The objection to this method is that two men are idle while the wagon is being taken to and from the field; and, if the haul is more than a quarter of mile, considerable time will be lost. Labor cost for this method is \$0.95 per ton.

Crew No. 4

Crew No. 4 consists of three men and one boy. The method used is common for New York State. Two mowers run from 8:30 until noon. In the afternoon one man rakes with a side-delivery rake, two men build the load, using a loader, and a boy drives the team. All three go to the barn to unload. This crew puts up eight acres, or twelve tons per day. Total man-hours per day are 27; horse-hours, 36; cost per ton, \$0.57, from standing grass to hay put away in the barn.

The cost of putting hay into the stack with the sweep and stacker, Fig. 634, is about the same as putting hay into the barn, using the loader, when the crew works hard and loses no time. The advantage of using the sweep and stacker is that nearly all of the hard work is done by horses, the only hand labor being that of building the stack.

The systems used as illustrations are a little above the average. On most farms but little thought is given to using the crew to best advantage, and the above illustrations show that there is a great variation in the cost of making hay, depending largely on how the crew works.

The United States Department of Agriculture has made an extensive study of crew management in hay-making throughout the eastern half of this country, and is prepared to furnish information in regard to crew management for all kinds of hay, and the advantage of using different kinds of hay machinery.

It is impossible in this short article to do more than touch on the importance of the proper organization of labor in haying; the point I am trying to bring out is that each hay grower should study the conditions on his own farm and try to use his labor to best advantage.

It will be found a very interesting study to draw diagrams of labor arrangements and find out the man and horse-hours per ton,

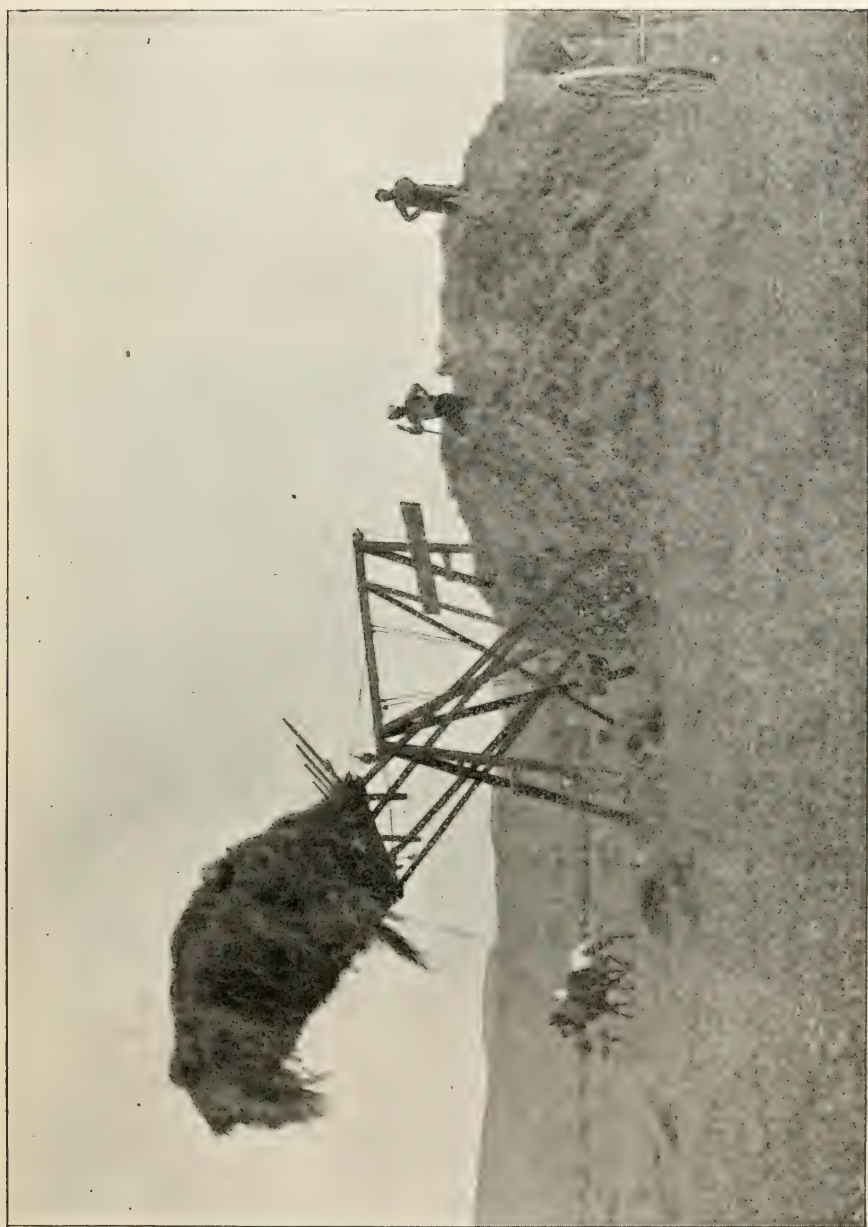


FIG. 634. PUTTING HAY INTO THE STACK WITH SWEEP-RAKE AND STACKER

total working hours, and quantity of hay made per day by different arrangements of the crew. Every farmer knows about how much hay his mower will cut per day or hour, also the quantity that can be raked, and that can be pitched on by hand, as well as the number of men necessary if hay is mowed in the morning or in the afternoon. Our investigations have shown that very little thought is given by the average hay grower to this important problem, and it is usually only when there is a rush of farm work and a shortage of help that circumstances force a farmer here and there to work out an economical and efficient method for getting in his hay.



FIG. 635. CURING HAY UNDER HAY CAPS. THIS IS THE SAFEST WAY TO MAKE HAY DURING UNFAVORABLE WEATHER; BUT LABOR COST IS HIGH.

The following illustrations show a very easy and simple method of plotting the hours of labor for a crew, and how, by a slight change in arrangement, the number of men in the crew may be reduced without reducing the quantity of hay put up per

day. The first arrangement of the crew, consisting of five men and six horses, is as follows:

Mower operated from 1:00 to 5:00 P. M.

Rake operated from 1:00 to 3:30 P. M.

Two men pitch and one man and team hauls in afternoon from 1:00 to 6:00.

Hay harvested, six tons, or four acres, per day.

By rearranging the work, only three men and four horses are used:

Mower operated from 8:30 A. M. until noon.

Rake operated from 9:30 A. M. until noon.



FIG. 636. UNLOADING HAY BY HAND ONTO THE STACK. A SLOW AND EXPENSIVE METHOD SUITED ONLY TO A VERY SMALL ACREAGE.

In the afternoon three men haul in the hay, putting in six tons, or four acres per day. Man-hours, 3.5, and team-hours, 2.66 per ton. Labor cost per ton, \$0.95.

The objection to the first arrangement is that it requires a larger crew than the second arrangement; the mower stops at 5:00 o'clock, the rake at 3:30 P. M., and as these two men are,

not needed to haul in hay they will have to find some other farm work for the balance of the afternoon.

The second arrangement furnishes work for the balance of the day after each man begins. The mower is started after the dew is off, and the rake in time to get all raked by noon. The third man has the entire morning for plowing corn or for other work. Thus it will be seen that by rearrangement of the crew three men put away the same quantity of hay that five handle under the first arrangement.



FIG. 637. THE CHEAPEST AND QUICKEST WAY OF GETTING HAY INTO THE BALES. BALING IN THE FIELD USING SWEEP-RAKES TO BRING HAY TO THE PRESSES.

EDITOR'S NOTE.— On large farms, where a number of men and teams are employed and much hay is made, the writer has found the following plan most economical:

As soon as the dew is off, two teams mow until the requisite quantity is cut; the third team is put on the tedder (if the hay is heavy) on the previous day's mowing, then on the side-delivery rake. Two wagons are taken to the field as the teams go out, which are loaded in time to draw to the barn when the teams

return at noon. An extra man is frequently needed in the field to mow about the fences; he can assist in loading, thus keeping all of the teams busy. These loads are unloaded by the barn gang, which consists of two men, a boy, and a team, after dinner, while the field gang goes out and loads the first load.

The hay is put on with a loader, two men being employed. A man (preferably the farmer, who can then keep things moving at both ends) takes the third wagon and team to the field, bringing back the first load to be unloaded by the gang at the barn, returning to the field with an empty wagon. Thus no time is lost running back and forth. Our afternoon stunt is a load every twenty minutes.

The three wagons may be left unloaded over night, allowing the barn gang to milk or do other chores, and affording work in the morning before the hay is fit to cut. One heavy horse will serve to unload the hay. The other, driven by a boy, may then be employed on a rake to clean up the scatterings.

GRADES OF HAY AND STRAW *

ADOPTED BY THE NATIONAL HAY ASSOCIATION AT ROCHESTER,
N. Y., JULY 7, 1915

HAY

No. 1 Timothy Hay — Shall be timothy, with not more than one-eighth ($\frac{1}{8}$) mixed with clover or other tame grasses, may contain some brown blades, properly cured, good color, sound and well baled.

No. 2 Timothy Hay — Shall be timothy, not good enough for No. 1, not over one-fourth ($\frac{1}{4}$) mixed with clover or other tame grasses, fair color, sound and well baled.

No. 3 Timothy Hay — Shall include all timothy not good enough for other grades, sound and reasonably well baled.

Light Clover Mixed Hay — Shall be timothy mixed with clover. The clover mixture not over one-third ($\frac{1}{3}$), properly cured, sound, good color and well baled.

No. 1 Clover Mixed Hay — Shall be timothy and clover mixed, with at least one-half ($\frac{1}{2}$) timothy, good color, sound and well baled.

No. 2 Clover Mixed Hay — Shall be timothy and clover mixed, with at least one-fourth ($\frac{1}{4}$) timothy, reasonably sound and well baled.

No. 1 Clover Hay — Shall be medium clover, not over one-twentieth ($\frac{1}{20}$) other grasses properly cured, sound and well baled.

No. 2 Clover Hay — Shall be clover, sound and reasonably well baled, not good enough for No. 1.

Sample Hay — Shall be sound, reasonably well baled, mixed grasses, threshed, or hay not covered by other grades.

No Grade Hay — Shall include all hay, musty, or in any way unsound.

Alfalfa

Choice Alfalfa — Shall be reasonably fine leafy alfalfa of bright green color, properly cured, sound, sweet, and well baled.

* Montgomery County Farm Bureau News, Vol. 2, No. 8, May, 1916.

No. 1 Alfalfa — Shall be reasonably coarse alfalfa of a bright green color, or reasonably fine leafy alfalfa of a good color and may contain 2 per cent of foreign grasses; 5 per cent of air-bleached hay on outside of bale allowed, but must be sound and well baled.

Standard Alfalfa — May be of green color, of coarse or medium texture, and may contain 5 per cent foreign matter; or it may be of green color, of coarse or medium texture, 20 per cent bleached and 2 per cent foreign matter; or it may be of greenish cast, of fine stem and clinging foliage, and may contain 5 per cent foreign matter. All to be sound, sweet and well baled.

No. 2 Alfalfa — Shall be any sound, sweet, and well-cured alfalfa, not good enough for standard, and may contain 10 per cent foreign matter.

No. 3 Alfalfa — May contain 25 per cent stack-spotted hay but must be dry and not contain more than 8 per cent of foreign matter; or it may be of a green color and may contain 50 per cent of foreign matter; or it may be set alfalfa and may contain 5 per cent foreign matter. All to be reasonably well baled.

No Grade Alfalfa — Shall include all alfalfa not good enough for No. 3.

STRAW

No. 1 Straight Rye Straw — Shall be in large bales, clean, bright, long rye straw, pressed in bundles, sound and well baled.

No. 2 Straight Rye Straw — Shall be in large bales, long rye straw, pressed in bundles, sound and well baled, not good enough for No. 1.

No. 1 Tangled Rye Straw — Shall be reasonably clean rye straw, good color, sound and well baled.

No. 2 Tangled Rye Straw — Shall be reasonably clean, may be some stained, not good enough for No. 1.

No. 1 Wheat Straw — Shall be reasonably clean wheat straw, sound and well baled.

No. 2 Wheat Straw — Shall be reasonably clean; may be some stained, not good enough for No. 1.

No. 1 Oat Straw — Shall be reasonably clean oat straw, sound and well baled.

No. 2 Oat Straw — Shall be reasonably clean; may be some stained, not good enough for No. 1.

REDTOP

LYMAN CARRIER, Washington, D. C.

Agronomist in Charge of Pasture Investigations, Bureau of Plant Industry, United States Department of Agriculture

HISTORY



The early history of redbtop (*Agrostis alba*) is obscure. There are several reasons for this. The common name redbtop was first applied in New England to *Poa pratensis*, now commonly known as June grass or Kentucky blue grass. Many of the early references were too indefinite to enable one to be sure just what species of grass were meant. Redtop is undoubtedly a native of Europe, but it did not interest agricultural writers

previous to the beginning of the nineteenth century, either in Europe or America. It was probably introduced into the United States at a much earlier date than any references to it occur in literature. It was also confused quite generally with Rhode Island Bent, a much smaller and inferior hay plant.

BOTANY

The botanical classifications of the genus *Agrostis*, to which redbtop belongs, has been badly confounded. There are several species of *Agrostis* that differ considerably in habit of growth and general appearance, yet are nearly alike when the common botanical characters are compared. There are also wide variations in each species, one species blending into another without a clear line of demarcation.

It is not surprising that much confusion has occurred in identifying these different species. Some botanists have classified as distinct species, plants which others consider as varieties of other species. It is impossible in all cases now to state what were the plants to which the original names were applied. This is of

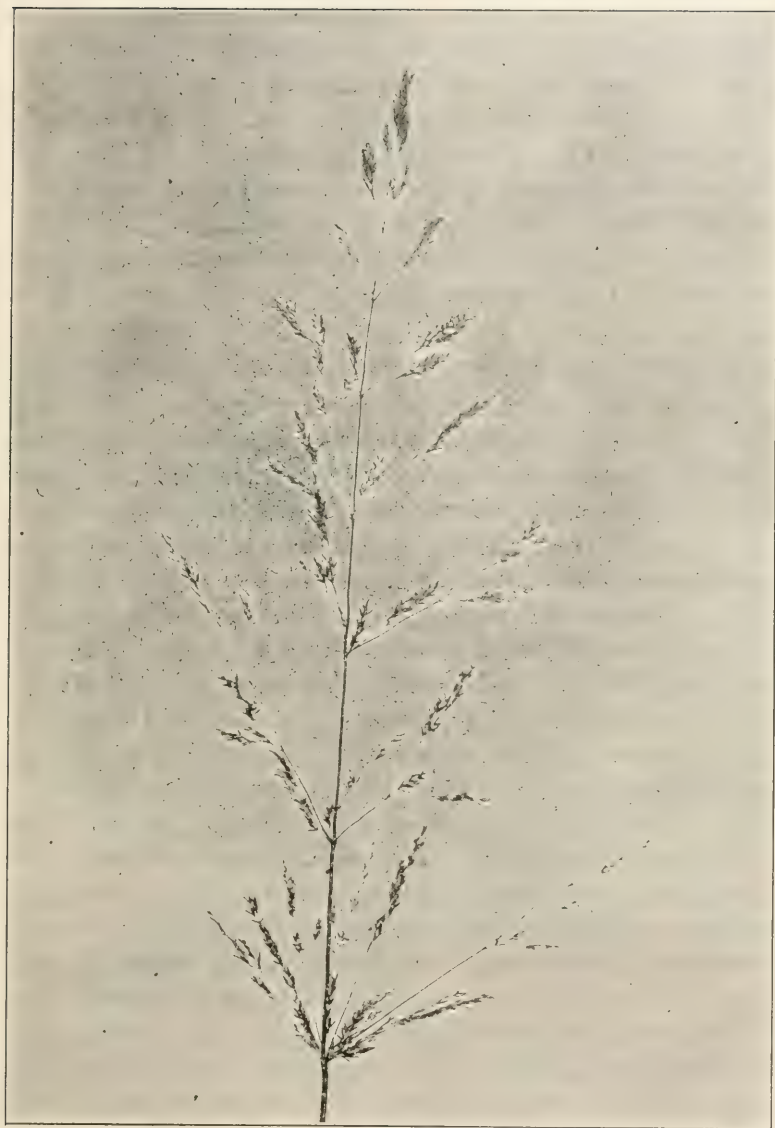


FIG. 638. HEAD OF RED TOP.

small importance provided all could agree on the use of one classification. There are four of these grasses of some commercial importance. Three of these, Rhode Island Bent (*Agrostis vulgaris*), Creeping Bent (*Agrostis stolonifera*), and Velvet Bent (*Agrostis canina*), are valuable lawn grasses, but of little value for hay or grazing. Redtop (*Agrostis alba*) is the most valuable grass belonging to this group from the standpoint of a farm crop.

Redtop is a perennial, with slender, erect, smooth stems, one to two feet high, arising from creeping rootstocks. The leaves are flat, narrow, and slightly rough, and two to three inches long.

VALUE

To many farmers redtop is considered a valuable grass, while others look on it as worthless and in some cases as a pest. It may be well to look at the good qualities of the plant first, and then take up its objectionable features. Redtop will grow on a great variety of soils and under a wide range of climatic conditions. It is the best wet land grass among the economic species. Lands that are too wet for redtop are hopeless as far as growing tame hay is concerned. On the other hand, redtop is often used to cover banks and terraces that are too dry for blue grass and most other lawn grasses. It has considerable value as a sand binder and is often used for that purpose.

Redtop grows in every state of the Union, but is of greatest value in the eastern half of the United States. It survives the coldest winters of the northern states and the hottest summers of the South, provided conditions of moisture are favorable. As previously stated, it is not very particular in regard to moisture conditions. Add to these qualifications the facts that it will thrive on soils so sour that timothy and red clover fail; that it makes a fair yield; that it makes good pasture and will withstand heavy trampling; and that it lasts for many years when once seeded: it is then easy to see that there is a place for redtop in American agriculture, and that it is worthy of careful consideration.

The chief objections to redtop are that it makes a smaller yield of hay than timothy or clover; that the hay is wiry and not

especially palatable to stock; and that it may become under favorable conditions a weed pest in cultivated fields. Hay buyers object to redtop in timothy hay, and, as it will volunteer for many years when once established on a farm, it may in some cases become quite troublesome. It will add somewhat to the total yield of hay produced when combined with clover and timothy. At the Virginia experiment station redtop alone yielded at the rate of 3,307 pounds per acre; timothy, 3,857 pounds; timothy and redtop, 4,460 pounds; and timothy, redtop, and clover, 5,440 pounds. (Bull. 193, Virginia Exp. Sta.) An addition of redtop to the hay mixture is probably advisable in all cases under New York State conditions, except where the farmer is producing a fancy grade of timothy for market.

CULTURE

In most cases redtop should not be seeded alone. It may be combined with meadow fescue and alsike clover for wet lands, and with timothy and red clover for those that are better drained. The seed is very small and if not over two years old usually germinates well. A less amount of seed of redtop is needed per acre than is required of timothy or clover. Three or four pounds of good redtop seed per acre are usually sufficient when seeding in mixture and twice those amounts will do where it is seeded alone. The seeding may be done at any time when it is safe to seed timothy.

A common practice is to mix the redtop with the timothy seed and sow along with wheat in the fall, or with oats in the spring. A stand may be obtained with a greater degree of certainty by preparing a fine, mellow seed bed and seeding the grass about the middle of August without a grain crop. In that case the clover may be seeded with the grass instead of waiting until early spring, as is commonly practiced.

In conclusion it may be stated that redtop is recommended for soils needing lime, for wet soils, for holding banks and terraces, and in hay mixtures under general farm conditions.

ORCHARD GRASS

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Orchard grass, *Dactylis glomerata*, is native throughout most of Europe and portions of central Asia and northern Africa. There are a number of cultivated species, but the common form is the only one that has come to be of economic importance. Just when it was brought to this country is not definitely known, but probably in early colonial times, as it was cultivated in Virginia before 1760. Like timothy, orchard grass was first cultivated in America, and its culture in Europe did not become important until long after it was well known here. At the present time, it is of relatively more importance in Europe than in this country.

DESCRIPTION

Orchard grass is commonly known in England and New Zealand as "Cocksfoot," because of a fancied resemblance of its spreading one-sided panicle to a cock's foot, a character that is very distinct and which makes the grass easily recognized. It grows in bunches or tussocks, producing few stolons and spreading very little. It does not form a dense sod as does blue grass or redtop. For this reason it is not suitable for seeding alone for hay or pasture, but it is usually sown in mixtures with other grasses or with clovers. It is one of the earliest grasses to start in spring and continues its growth until very late in the fall. It is also able to grow during the hot, dry weather of midsummer in the southern and western part of the blue-grass belt, thus excelling blue grass as a midsummer pasture grass in those regions. It grows well in shaded places and makes a desirable grass for woods pasture.

Orchard grass furnishes abundant forage and, if harvested promptly after full bloom, makes a very palatable hay. The stems become rather coarse and woody, however, as they mature, and unless cut at the proper time it makes a rather coarse hay. A heavy leaf growth is made near the ground, and, when the stems are kept down by close cropping or frequent clipping, an abundance of nutritious herbage for pasture is produced.

CLIMATIC AND SOIL ADAPTATIONS

Orchard grass will grow farther south and in warmer and drier regions than will timothy and blue grass. It is more easily injured by winter freezing and late frosts than either of these grasses and is most useful in those regions toward the south of the timothy and blue-grass belt. Its ability to grow well on dry hill lands makes it of especial value in those regions where timothy and blue grass are liable to be destroyed by the hot, dry weather of mid-summer. In the cooler regions, particularly in the North Atlantic and New England states, it is not regarded as valuable as timothy for hay or as blue grass for pasture, although it may be used profitably in mixtures with these grasses.

It is cultivated most extensively in the United States along the southern border of the timothy region, particularly in Virginia, West Virginia, North Carolina, Kentucky, Tennessee, southern Missouri, and northern Arkansas. This distribution is apparently due to competition with timothy and blue grass. Toward the north of this region timothy and blue grass are better than orchard grass, but here the summers are too hot and dry for timothy and blue grass to succeed well. In fact, in these regions timothy is usually confined to the better and more moist valley and bottom lands, while orchard grass replaces it on the higher and drier lands.

Orchard grass has rather wide soil adaptations, growing well on fairly sandy soils to heavy clays. While it prefers a moderate amount of moisture, it is one of the best grasses for thin, dry, and stony lands. This characteristic makes it well suited for both hay and pasture on the dry hill lands of the Virginias, Kentucky, Tennessee, and southern Missouri. In direct contrast with its adaptation to dry hill lands is its ability to grow in cool, wet,

shady places and on bottom lands subject to overflow. It is apparently better able to withstand overflows than is timothy, and fully as able as redtop or blue grass.

METHODS OF CULTURE

Seeding

Orchard grass is very slow in starting and, until it is well established, is easily injured by frosts and winter freezing. For this reason it is best seeded in spring. Toward the south it may be seeded in the fall with wheat or rye, but the usual practice is to delay seeding until the following February or March. It is seeded both alone and in mixtures of grasses and clovers. In the seed-growing regions it is usually seeded alone at the rate of one bushel or fourteen pounds of seed to the acre. Where it is grown for hay, a heavier rate of seeding is employed — twenty to twenty-five pounds — but the thinner rate is better for seed production. The seed is very chaffy and light and does not readily feed through an ordinary drill. It is, therefore, usually sown broadcast with a wheelbarrow or other seeder and covered shallow with a light harrowing.

Orchard grass is also sown in spring with oats or barley as a nurse crop. In this case the oats or barley should be drilled in on a well-prepared seedbed and the orchard grass seeded later, usually without covering the seed. Care should always be taken not to cover the seed too deeply, as this interferes seriously with germination and may result in a poor stand. Wheat or rye are better nurse crops for orchard grass than oats or barley, except in the more northern sections, as they mature earlier, and the shade that the crop causes is removed before the hot, dry weather of midsummer comes on. If allowed to mature grain, oats and barley usually dry the soil out more than wheat or rye, and the grass plants suffer from a lack of moisture, especially in dry regions. If seeded thinly, however, and cut early for hay when the grain is in the soft dough stage, they make very satisfactory nurse crops.

Orchard grass is sometimes seeded alone on a specially prepared seedbed without a nurse crop, but when this is done weeds sometimes come in before the slow-growing grass becomes well estab-

lished and smothers it. In dry seasons and on thin lands, however, better stands may usually be had by seeding alone than by using a nurse crop. If seeded alone, a light cutting of hay is usually secured the first year, but if a nurse crop is used, the grass is not cut until the following year.

Mixtures for Hay

On account of its bunching habit of growth, orchard grass is seldom seeded alone except where grown for seed. Even in the seed-producing sections it is sometimes seeded with red or alsike clover. The latter is perhaps best, since it does not grow so tall, and the orchard grass can be cut above the alsike, leaving the stubble and most of the leaves of the grass with the alsike for pasture or hay. Red clover, however, grows so tall that much of it is cut with the orchard grass and the presence of the leaves in the seed is objectionable. If red clover is used with orchard grass, the first crop is frequently cut for hay and the second crop for seed. In subsequent years the red clover largely disappears, and either crop may be cut for seed without difficulty.

Toward the southern part of the timothy region, orchard grass frequently replaces timothy for hay. Here, a mixture of twenty pounds of orchard grass and eight or ten pounds of red or mammoth clover will make an excellent meadow; usually two cuttings may be had and both are used for hay.

In those sections of the East where the practice of using general mixtures of clovers and grasses for hay is more common than in the Central West, orchard grass should be included in such mixtures. A mixture of ten pounds of orchard grass, six pounds of timothy, four pounds of redtop, five pounds of red clover, and three pounds of alsike clover to the acre will make an excellent meadow. Tall meadow oat grass and meadow fescue also are sometimes mixed with orchard grass. A mixture of such grasses not only improves the palatability of the hay, but also increases the yield over seeding any one grass alone. The practice of mixing grasses both for meadow and for pasture is much more common in Europe than in this country, but it is gaining in importance here.

Mixtures for Pasture

For pasture, a mixture of eight pounds of orchard grass, ten pounds of blue grass, four pounds of timothy, three pounds of redtop, two pounds of red clover, and a pound each of alsike and white clover will give good results, especially on lands in the northeastern United States where the rainfall is abundant. On thin, dry, stony lands the proportion of orchard grass in such a mixture should be increased and the blue grass decreased, since orchard grass will withstand droughty conditions much better than blue grass. In these mixtures orchard grass will not become prominent for two or three years, as its development is very slow as compared with other grasses. The quicker growing grasses and clovers in such mixtures will furnish most of the pasture for the first year or two. Orchard grass, however, is a long-lived and persistent grass, and ultimately under favorable conditions will dominate and furnish the bulk of the permanent pasturage.

Seed

If it is grown for seed, it is usually seeded alone; or, if mixed with clover, the first crop is made into hay and the following crops used for seed. It is harvested with a binder set to cut the grass high so as to leave as much of the leaf growth on the ground as possible and to escape the low-growing weeds or clover. The remaining growth may then be pastured off or cut later for hay. The bundles are set up in small shocks and after curing are threshed with an ordinary grain thresher, equipped with special riddles and using little air. Yields of twelve to fifteen bushels to the acre are usually obtained.

HAY

Most farmers in the timothy region prefer timothy to orchard grass for hay. Its chemical analysis shows it to be about equal to timothy in feeding value, but in practice timothy usually makes a better hay. This is doubtless due to the fact that orchard grass loses its palatability rapidly as it matures. Unless cut within a very short time after bloom, it makes a coarse, woody hay. If, on the other hand, it is cut at the proper time, an excellent hay can be made. There is, however, little market

demand for it, and this is doubtless an important reason why farmers have not made more use of it.

VALUE OF CROP

Orchard grass does not seem to be able to compete with timothy as a hay crop in the main part of the timothy region. It has no advantages over timothy and apparently several disadvantages. In this region, its chief value is in mixtures of various grasses and clovers for hay. Toward the south of the timothy region, it may take the place of timothy or supplement it in mixtures and thus increase the yield and improve the quality of the hay crop in those regions.

It has a much more important place in general mixtures for pastures than for hay. In the South its value as a pasture grass on the dry, stony, hill lands is especially great. In the North, its ability to grow in cool weather, and also during the midsummer months when the growth of blue grass slackens, will enable it to increase the pasture throughout the season materially.

THE BLUE GRASSES IN NEW YORK STATE

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Kentucky blue grass (*Poa pratensis*) and Canada blue grass (*Poa compressa*) are among the most valuable grasses in New York State. The first named has long been recognized as the premier pasture and lawn grass of the northern United States. Farmers in New York have been slow to recognize its value, partly due to the fact that this grass does best in soils of high lime content and many of the soils of this state are deficient in lime. However, it is safe to assume that very few localities in the state show the absence of either of these blue grasses. The object of this article is to point out their value to the farmers of the state, together with some of their characteristics and easy methods of identification.

KENTUCKY BLUE GRASS

Synonyms of Kentucky blue grass are blue grass, June grass, green grass, spear grass, and smooth-stalked meadow grass.

Description

The culms are erect and from one to three feet in height. The stems are round, smooth, finer than timothy or orchard grass, and of a dark green color. The leaf sheath has a short, obtuse ligule and the leaf has a round, concave tip. The inflorescence shows as an open, spreading, pyramidal panicle with three- to five-flowered spikelets. The rough outer glumes are shorter than the awnless keeled lemma, and the rachilla is usually hairy or pubescent. When fully headed, the panicle of Kentucky blue grass shows varying shades of color from green to purple. The seed is firmly enclosed in the lemma and palea and does not come free at the time of threshing.

A good pasture grass must be a turf-forming grass and should be able to reproduce itself vegetatively as well as by its seed. The

blue grasses are strongly stoloniferous; that is, they send out rhizomes or underground stems which reproduce new culms or plants, which in turn send out their roots into the soil. This type of grass may be pastured closely and never reseed itself; yet, under favorable conditions, it will live indefinitely. These rhizomes are difficult to eradicate, especially in the heavier soils. In general, Kentucky blue grass is not a deep-rooted plant and it suffers in protracted periods of dry, hot weather.

Adaptation

This grass reaches its best development on fertile, well-drained limestone soils. Soils that have grown hardwood forests seem adapted to its growth. It grows better on clay and clay loams than on sandy soils. Much of the land in New York State is too acid for the best growth of Kentucky blue grass, and its shallow roots cause it to be readily affected by a lack of moisture, especially during July and August.

Seeding

Kentucky blue grass seed comes chiefly from a limited area near Lexington, Kentucky. Because of the methods of harvesting, the germinating quality of the seed is often low, the usual standard of germination being only about 50 per cent. The purity of the seed, however, is usually good, the most common adulterant being seed of Canada blue.

This grass should not be planted alone for permanent pasture, because of its slowness in starting. When twenty-five years old, pastures of Kentucky blue grass are more efficient than when only five years old. As it forms a sod slowly, for the first two or three years it is necessary to grow with it the more rapidly growing, shorter-lived grasses and clovers. It may be seeded in a mixture in late summer or early fall, alone, or with a nurse crop of wheat or rye. Spring seeding is often resorted to, using oats or barley as a nurse crop. In this case, however, a light seeding of the nurse crop should be made to prevent the coarser-growing annuals from choking out the more delicate grass and clover plants.

A permanent pasture mixture for good land in New York State in which Kentucky blue grass will in time become the dominant grass is as follows:

	Pounds per acre
Timothy	10
Kentucky blue	4
Meadow fescue	2
Orchard grass	2
Red clover	6
White clover	1
Alsike clover	2
	27

This mixture will not only give immediate results but will improve with age. For the first two or three years timothy, orchard grass, and red and alsike clover will furnish the main part of the pasturage. The blue grass, meadow fescue, and white clover will gradually become dominant. Finally, after seven or eight years, the blue grasses will form the chief element in the pasture.

As a Lawn Grass

Kentucky blue grass is the favorite lawn grass for the northern states. A complex mixture is not desirable for lawns and no coarse, semipermanent grass should be added. A mixture of three parts by weight of Kentucky blue grass and one part of white clover is commonly used. Heavy seeding is advisable. The soil should have garden bed tilth, and a nurse crop is not to be recommended. On very poor soils it may be necessary to mix Canada blue or redtop with the seed. Fall seeding is preferable to any other period of the year.

Summary

Summarized briefly, the advantages of Kentucky blue grass are as follows: It starts growth early in the spring and grows late in the fall. It is very nutritious and palatable for all classes of live stock. A compact sod is formed, which stands trampling well and may be grazed closely without injury. Close, continued clipping on lawns improves the stand.

Kentucky blue grass has some weaknesses as a forage plant, however, and these should be recognized. Commercial seed is usually low in germinating power. It will not grow well on acid soil, and even under good soil conditions takes possession of the ground slowly. During protracted dry weather in July and August, growth is likely to be seriously checked; and in regions where such droughts are common the pasture must be supplemented with some other form of forage.

CANADA BLUE GRASS

As compared with Kentucky blue this grass is characterized by a greenish blue color; shorter, flattened culms with nearly solid, zigzag stems; short, narrow panicles with three to nine seeds to a spikelet. Seed differences are microscopical. Kentucky blue has a more pointed lemma and is usually five-nerved, while Canada blue has a shorter seed and the nerves have a tendency to be marginal.

Canada blue grass is generally looked upon in New York State as complementary to Kentucky blue grass. On poor, strongly acid, or extremely dry soils it may be grown to the exclusion of Kentucky blue. On fertile soils of high lime content it should not be sown. There are large areas, however, where a mixture of the two is not only profitable but desirable.

Like Kentucky blue, it should be sown in a mixture of other grasses and clovers. The following combination will be found desirable for the poorer lands of New York State:

	Pounds per acre
Timothy	10
Redtop	6
Canada blue grass	4
Alsike clover	4
White clover	2
	26

Within a few years the chief herbage on land sown to this mixture will be redtop and Canada blue grass.

THE MILLETS — THEIR CULTURE AND UTILIZATION IN NEW YORK

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The term millet commonly refers to those annual grasses, other than corn, sorghum, rice, and the small grains, which are cultivated for their edible seeds or for forage purposes. In New York the millets are considered almost entirely as forage crops and the acreage harvested for seed is negligible, not being sufficient in most cases to supply enough seed for the following year's sowing. Much of

the millet seed used in New York is produced in the states farther south and west.

In Asia and certain parts of Europe, especially Russia, the millets are grown almost entirely as grain crops, and in some of these countries they make up a considerable percentage of the food consumed by the people. Only the proso, or broom-corn millet, is looked on as a grain crop in the United States, and it is not grown to any extent in New York. Those grasses that are usually classed as millets are listed below with their common and botanical names:

Common names*	Botanical names*
Foxtail millet.....	} <i>Chaetochloa italica</i> (L.) Scribner
Italian millet.....	
Proso.....	} <i>Setaria italica</i> Beauv.
Broom-corn millet.....	
Hog millet.....	
Russian millet.....	
Barnyard millet.....	} <i>Panicum miliaceum</i> L.
Japanese millet.....	
Sanwa millet.....	
Billion-dollar grass.....	
Pearl millet.....	} <i>Echinochloa frumentacea</i> (Roxb.) Link.
Penicillaria.....	
Cat-tail millet.....	
Egyptian millet.....	
	} <i>Panicum frumentaceum</i> Roxb.
	} <i>Pennisetum glaucum</i> (L.) R. Br.
	} <i>Pennisetum typhoideum</i> Rich.

Common names*	Botanical names*
Ragi.....	} <i>Eleusine coracana</i> (L.) Gaertn.
Finger millet.....	
Coracan.....	
Shama millet.....	} <i>Echinochloa colona</i> (L.) Link.
Jungle rice.....	
Texas millet.....	} <i>Panicum texanum</i> Buckl.
Colorado grass.....	
Kutki millet.....	<i>Panicum psilopodium</i> Trin.
Koda millet.....	<i>Paspalum scrobiculatum</i> L.
Little millet.....	<i>Panicum miliare</i> Lamarek

* In the case of synonyms the preferable name is given first, both in the common and botanical names.

Only the first four are of any importance in the United States. The Texas millet, or Colorado grass, is cultivated sparingly in Oklahoma, Texas, New Mexico, and Colorado, and the ragi, or finger millet, is of some importance in India and northern Africa; but the others, Shama, Kutki, Koda, and Little millet, are grown only as famine crops in India, and are not valued in other countries where better crop plants are available. The sorghums are referred to in India, Korea, and certain parts of China as "giant millet," or "tall millet," but fortunately this practice has not spread to the United States.

The foxtail millets are the only ones that are of any importance in New York, and it is only this group, therefore, that will be discussed in detail.

FOXTAIL MILLETS

The foxtail millets are among the oldest of cultivated crops, their cultivation being recorded in China as early as 2700 B. C. They are supposed to be natives of southeastern Asia and to have spread from there westward to Europe. In the United States they are grown very largely as catch crops, and are suited to a wide range of climates and soil. (Fig. 639.) The quality of hay produced is rather inferior, especially if allowed to become too ripe before it is cut. It is both laxative and diuretic, especially in its effect on horses, and when fed continuously frequently produces

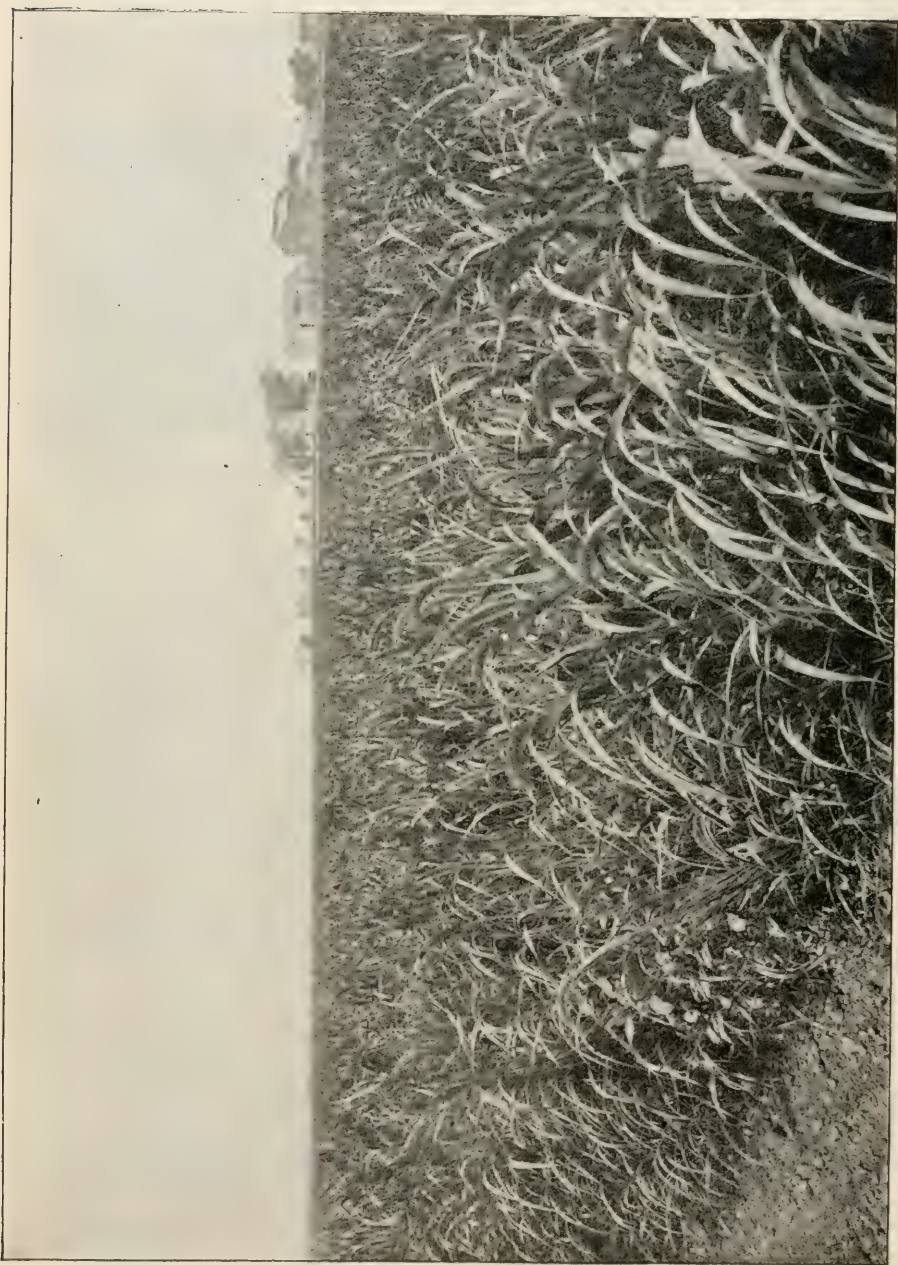


FIG. 639.—A FIELD OF FOXTAIL MILLET IN SOUTH DAKOTA WHICH HAS BEEN SEEDED WITH A GRAIN DRILL.

deleterious results. It is also reported to produce physiological disturbances when fed continuously to lambs, but in the case of cattle and sheep such effects are apparently not serious.

These millets have a comparatively low water requirement, but cannot endure long periods of drought, probably because of their rather shallow root system. They are much grown in the semiarid regions, and their ability to make a crop in such localities seems largely due to their short season of growth, which often allows them to escape dry-spells.

Foxtail millet is said to be "hard on the soil," and the following crop, especially if it is small grain, will in most cases be less productive than if grown following corn or the small grains. This effect arises largely from the fact that millet has an intensive root system and feeds very heavily on the upper eight or twelve inches of soil, leaving the supply of available plant food and moisture greatly depleted in this area.

Only the more prominent varieties are described in this article. Several of these are so closely related that it is impossible to distinguish between them by an examination of the seed alone, but when the crop is examined in the field the differences between the varieties are apparent.



FIG. 640.— SINGLE PLANT OF COMMON MILLET.

Common Millet

This variety is the best known, and perhaps the most widely grown, of any of the foxtail millets. It is fine-stemmed and leafy with a close, compact head tapering slightly towards the upper end, the lower part of the head usually being looser than the middle and upper part. (Fig. 640.) The individual seed is yellow to straw-color, oval to elliptical in outline, and flattened on one side. Common millet is characterized by a short season of growth, being one of the earliest of the foxtail millets. Tests in the central states show that under average conditions it can be cut 69 days after the date when sown, and in many cases only 50 days are required for it to mature sufficiently for hay. Under favorable conditions it produces from one to two tons of hay per acre, and this hay is of first-class quality on account of the slender stem and abundant leaves.

California and Gold-mine Millets

The California and Gold-mine millets are leafy, heavy-yielding varieties that are closely related to common millet. Neither of these varieties is very well known, but the Gold-mine especially deserves a wider utilization and should be planted by farmers in preference to common millet in sections where its seed is available.

German Millet

Several writers have confused this variety with the Hungarian millet, which came to the United States under the technical name of *Panicum germanicum* and was locally grown for several years as "German millet." German millet, on the other hand, was known in early days as "Bengal grass," but just how this name originated cannot be determined. German millet first became important in the central valley of Tennessee, and this locality has continued to be the center of its distribution, many farmers in the vicinity of Franklin, Tenn., making a specialty of the production of German millet seed. This variety has almost entirely supplanted other foxtail millets in the southern states, and besides is perhaps the principal millet in the central states, since it is handled by more seedsmen than any other variety. In many places where it is grown, the season is not long enough to mature a seed

crop, but it does become sufficiently mature for hay and makes larger yields than the earlier kinds.

German millet has heavy stems with broad leaves and a distinctly lobed head, nearly twice the diameter of that of common millet, but only slightly longer and not so compact. (Fig. 641.) The individual seeds are smaller and more nearly round in outline,



FIG. 641.—A SINGLE PLANT OF GERMAN MILLET.

and the surface is rougher and does not have the shiny appearance that is characteristic of the seed of common millet. Considerable difficulty is encountered in distinguishing between the seed of these two varieties. This difficulty is partly due to the frequency with which the two varieties are found mixed, and the fact that

no recognized type of seed has been described and established for German millet. German millet is a long-season variety, requiring on the average about 87 days, although under favorable conditions 65 days are sufficient for a hay crop. The hay yield is larger than that of common millet, but the quality of the hay is not so good.

Golden Wonder Millet

This variety has a heavy stem and broad leaves very much like those of the German millet, but the head, although distinctly lobed, is more compact, longer, and more slender than that of the latter variety, and the bristles are so short as to be scarcely noticeable. It makes good yields of both forage and seed, and for a time was widely advertised as a new millet of very desirable qualities,

but it was found to be more easily harmed by dry weather than other well-known varieties. This, together with the difficulty of obtaining reliable seed of it, has prevented its wide utilization.



FIG. 642.—A SINGLE PLANT OF HUNGARIAN MILLET.

Hungarian Millet

Hungarian millet is characterized by its slender stems and small, compact head, which in size and shape very closely resembles that of common millet. (Fig. 642.) The bristles, however, are usually purple in color, which, with the intermixture of dark-colored seeds, give the head a darker appearance than that of common millet. The individual seeds are perhaps a trifle smaller, but have the

same oval to elliptical outline as those of the common millet. The color of the seed varies from pale yellow to dark purple, seeds of both colors being found in one head, but the colors are not mixed in a single seed. The season of maturity is about the same as that of the common, averaging 69 days in the central states, but it will mature for hay in 54 days when soil and climatic conditions are right. Hungarian millet is not so well adapted to the dry climates as is common millet, and the yield in such localities is likely to be small, but in the eastern states, where rainfall is greater, Hungarian millet does well and is rather widely grown.

The quality of the hay is first-class, and chemical analyses seem to indicate a slightly higher protein value for it than for the hay of other millets. The main objection to Hungarian millet in the humid regions has been its tendency to volunteer and persist on the ground whenever it was allowed to produce seed.

Siberian Millet

This variety was obtained from Russia about 1895, and was handled by the seed trade under this name for many years before the other two orange-seeded varieties, Kursk and Turkestan, were introduced by the United States Department of Agriculture. Siberian millet is a hardy and drought-resistant type suited to Minnesota, the Dakotas, Montana, Wyoming, Colorado, western Nebraska, and western Kansas. In



FIG. 643.—A SINGLE PLANT OF SIBERIAN MILLET.

habit of growth and vegetative characters generally it is similar to common millet, but is a trifle more vigorous and the head is somewhat larger. (Fig. 643.)

The seeds, although usually similar in shape to those of common millet, are a pale orange in color, and this character provides an easy method of identifying the Siberian millet when seed is being purchased. The season of growth is slightly longer than that of common millet, and the yield is somewhat larger, the hay being about the same as that of common millet in quality and feeding value.

Kursk Millet

This is a selected variety of the Siberian group of millets, which was introduced by the United States Department of Agriculture and has been bred in South Dakota for earliness, drought resistance, hardiness, and uniformity. It was given the name "Kursk" from the province of Russia where it was obtained. It is a dependable millet for the dry situations and is adapted to the same region as the Siberian variety.

SEEDING AND HARVESTING

Recommendations in regard to seeding, harvesting, and feeding apply to all the varieties in this group.

Seeding

The short season of growth permits considerable latitude in respect to the time of seeding. Millet should not be sown, however, until the ground is warm. This means, ordinarily, about two or three weeks after corn-planting time, which in New York would place the earliest planting from about May 20 to 30. It can be sown any time between this date and August 1; the last seeding, however, should allow 60 to 70 days of growing season before the normal date of the first killing frost, which in central New York is October 15.

The seed bed for millet should be prepared by plowing and repeated harrowing. It can be seeded on cornstalk ground, but

the best results are obtained by seeding on spring plowing, especially if care is used to level and compact the seed bed.

Millet can be sown broadcast and harrowed in or planted with a grain drill. When good seed is used, 20 to 25 pounds an acre is sufficient.

It is often possible to grow a crop of millet after another crop, such as oats, barley, or wheat, has been removed from the land. In such cases the ground may be prepared for seeding by disking, but plowing is preferable. Such double cropping, however, is not good practice, since it is hard on the land, both crops being surface feeders to a large extent.

One feature that should be borne in mind is to have the ground level after seeding, so that clods and other rough places will not interfere with the mowing machine. This smoothing may be accomplished by rolling or planking the field after it is seeded.

Harvesting

The foxtail millets cure easily and are handled in the same way as any other hay crop. If the hay is designed for general use — namely, for feeding both cattle and horses — it should be cut just after blooming; if it is intended for cattle or sheep exclusively, it may be allowed to become somewhat more mature and can then be cut when the seed is in the late milk stage. If a seed crop is the object, the millet should be allowed to stand until seed can be shelled from the earlier heads by rubbing them in the hand. When it has attained this degree of ripeness, it is best harvested with a grain binder, placed in shocks like bundle grain, and thrashed in the same way. In some sections where millet is being grown for seed the farmers plant it in rows sufficiently far apart to cultivate. This practice gives an especially good quality of seed; but, of course, requires more labor.

FEEDING VALUE OF THE HAY

Millet hay is usually considered inferior to that of timothy and some of the other tame grasses. To some extent, this is due to its lesser palatability, but also to the injurious effect that it often has on horses when fed continuously as the sole roughage.

Chemical analyses show that millet compares favorably in digestible nutrients with timothy and Johnson grass. The following analyses are taken from Henry and Morrison's *Feeds and Feeding*:

TABLE I
DIGESTIBLE NUTRIENTS IN 100 POUNDS OF THE DRY MATTER OF MILLET, TIMOTHY,
AND JOHNSON GRASS

CROP	CRUDE PROTEIN	CARBO- HYDRATES	FAT	TOTAL
	Pounds	Pounds	Pounds	Pounds
Millet.....	5.0	46.0	1.8	55.0
Timothy.....	3.0	42.8	1.2	48.5
Johnson grass.....	2.9	45.0	1.0	50.1

The Connecticut (Storrs) Experiment Station found Hungarian millet inferior to red clover hay when it was fed to dairy cows. Not only the amount of milk, but the percentage of butter fat, was increased by a change from millet to red clover hay.

The general opinion among feeders is that millet hay is somewhat more effective than prairie hay as a roughage for growing stock, especially cattle and sheep, but inferior to alfalfa or clover hay.

The injurious effect of a continuous ration of millet hay on horses was studied in 1896 by Dr. T. D. Hinebauch* of the North Dakota Experiment Station. He found that when a horse was fed millet exclusively as a roughage for any considerable period, a general debility was evident which later developed into a softening of the bones and inability to stand. Cessation of the use of the millet hay resulted almost immediately in improvement in the condition of the horse, while a resumption of the millet feeding was followed by a relapse. Dr. E. F. Ladd later found that the injury was caused by a glucoside called setarian, which is present in millet hay whether mature or not.

The belief is general that millet cut before seed has formed is much less injurious to horses, but the North Dakota experiments

* Hinebauch, T. D. North Dakota Experiment Station, Bulletin No. 26, November, 1896.

showed that cutting it before the seed has formed will not prevent injury. This injurious effect is noted first as producing an increased action of the kidneys; secondly, in causing lameness and swelling of the joints; thirdly, in producing infusion of blood into the joints; and, fourthly, in destroying the texture of the bone, rendering it softer and less tenacious so that the ligaments are often torn loose from the bone and the bones themselves break easily. These results were verified by a post-mortem examination of two horses that had been fed millet as their sole roughage, and can scarcely be subject to doubt, even though many newspaper articles deny that there is any danger in feeding millet hay to horses. When fed sparingly in connection with other kinds of hay, there is little danger of injury and it can be used in this way with good effect to augment a roughage ration for horses.

USE AS A GRAIN CROP

Foxtail millet has never been utilized to any great extent as a grain crop in the United States; and so long as corn and the small grains can be produced successfully in New York there will be little of the proso, or broom-corn millet, grown in the state, and almost none of the foxtail millet that is grown there will be harvested for grain purposes. In hog-feeding experiments, the South Dakota Experiment Station found that it required about 8 per cent more proso than it did barley to produce a pound of gain, and from this basis it would be about 16 per cent less efficient than corn as a hog feed. For feeding steers it required 37 per cent more millet than corn to produce a pound of gain, 29 per cent more than oats, and 22 per cent more than spelt. Other trials indicated that the seed of the foxtail millets was practically equal to that of proso in value when both were crushed before feeding. The seed of millet should always be crushed before feeding to animals other than poultry or birds, otherwise much of it passes through undigested.

Large quantities of millet seed are used as chicken feed and in prepared bird-feeds. Both foxtail and proso can be used very effectively in this way without grinding. An analysis of one prepared bird seed showed about 50 per cent to be common millet seed, which was the cheapest of all the constituents.

The legal weight per bushel for seed of the foxtail millets is 50 pounds in most states, and well-cleaned seed will weigh between 45 and 50 pounds to the bushel very consistently.

USE AS A PASTURE

Most of the millets are not suitable for pasture purposes, and this is especially true of the foxtail varieties. The main difficulty lies in the shallow root system, which allows the plants to be pulled up very easily. Another weakness of millet as a pasture plant is that it does not renew its growth very quickly after being cropped off; the common and Hungarian varieties are best in this respect. It is not to be recommended, therefore, as a pasture plant except to supply a limited amount of pasture in an emergency to young stock, such as calves or colts, and even for such animals some other annual hay plant might be used to much better advantage. Winter rye or spring oats will furnish more and better pasture than will millet.

VALUE OF MILLET IN ROTATIONS

Being annual crops, the millets can be used in almost any rotation where a spring-sown crop is required. Most farmers who have grown millet believe it to be rather exhaustive on soil fertility. It has been proved that no more plant food is removed from the soil by millet than by other crops, where a like tonnage of hay was produced. It is more likely that the effect on the following crop comes through the rapid depletion of available plant food and moisture in the upper six or eight inches of soil. Another way in which millet might have a bad effect on the following crop is because of the slight amount of vegetable matter which is left on the soil by a crop of millet which has been harvested for hay. Considering all of these points, it is likely that there is some foundation for the belief that a crop following millet will be less than one that follows a crop of small grain or corn, even though these other crops are not classed as soil builders. Millet can not be recommended, therefore, as a regular constituent in any rotation.

USE OF FERTILIZERS ON MILLET

Fertilizer tests with millet have given conflicting results, as they have with most other crops. It has been found, however, that a nitrate fertilizer is more likely to be profitable than either phosphate or potash. The crop on soils low in available plant food can be considerably increased by applications of nitrates and phosphates, or of barnyard manure, but it will usually be found more profitable to apply these fertilizers to the land when occupied by some other crop.

DISEASES OF FOXTAIL MILLET

The foxtail millets are very free from any destructive plant diseases. In some cases there is a slight tendency to smut, but this difficulty does not seriously affect the hay crop, and in the semiarid regions the extent of the damage to the crop of grain is very slight. The common smut of the foxtail millets is technically known as *Ustilago crameri* Körn, and it can be controlled by treating the seed with hot water or formalin, according to the published rules for treating the seed of the small grains for smut, page 2758. The formalin treatment is simpler and is recommended over the other method.

BARNYARD OR JAPANESE MILLET

Next to the foxtail millets the Barnyard, or Japanese, millet is of most importance in New York. This millet, as noted in the introduction, is known also as Sanwa millet and as Billion-dollar grass. The former name is the one used in India, while the latter originated with a certain seed firm here in the United States, supposedly being applied to Barnyard millet on account of its large yields of hay and seed. Dr. C. C. Georgeson, now agronomist-in-charge of the Alaska Experiment Stations, who spent several years in Japan as professor of agriculture in the Imperial Agricultural College at Tokio, says that the Japanese name for this millet is "Hie," and continues:* "This is a very common crop in all parts of Japan, especially in the hilly districts where there is no suitable rice land, or where water is not available for irrigation. It is grown entirely for its seed, which, when thrashed out and cleaned, is ground and used for human food, being eaten

* Crozier, A. A. Michigan Experiment Station Bulletin 117, p. 47 (1894).

mostly as porridge. Like all other crops in that country, it is cultivated in rows two feet apart, the seed being scattered in a continuous drill, or more commonly in little bunches, a foot apart in the row. It produces in good soil a vast amount of forage."

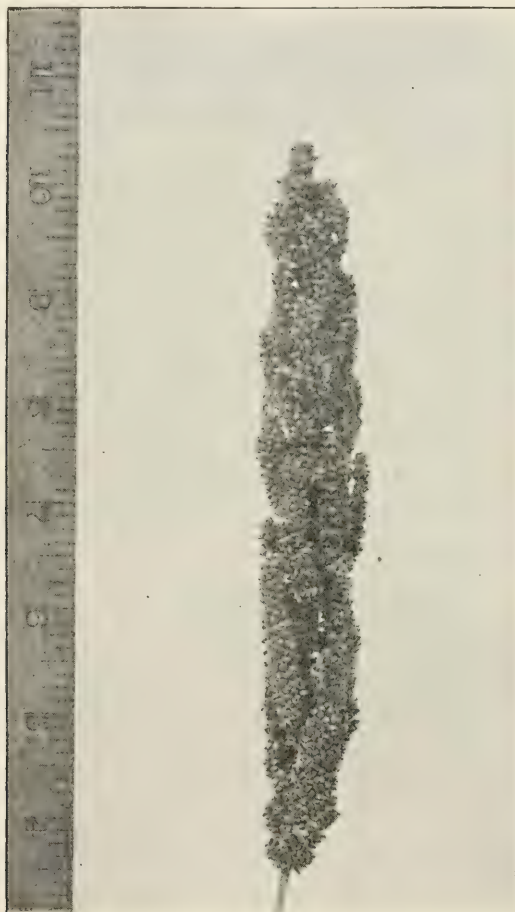


FIG. 644.—A SEED HEAD OR PANICLE OF BARNYARD OR JAPANESE MILLET. SCALE ON THE LEFT GRADUATED TO INCHES AND FRACTIONS THEREOF.

This millet probably originated from the common barnyard grass (*Echinochloa crus-galli*), which is a weed in cultivated fields and along watercourses in the tropics and warm temperate regions. Barnyard millet differs from the weed in its more erect habit of

growth, the more compact panicle, the greater turgidity of its seeds and in being uniformly awnless. (Fig. 644.) Both *Echinochloa crus-galli* and *frumentacea* have been sold as Billion-dollar grass, but for cultivation as a millet the awnless form *Echinochloa frumentacea* is preferable, and the farmer is justified in insisting on this form when purchasing seed of Barnyard, or Japanese, millet.

The methods of seeding and harvesting are the same with barnyard millet as with the foxtail millets. The time required for maturing a crop of hay is as long and in most cases longer than that needed for the German millet, so that this millet is not so well suited for a catch crop as are the common and Hungarian millets.

The stems of the barnyard millet are rather coarse, and, as it is more succulent than the foxtail millets, it does not cure so readily into hay; however, it is better suited for soiling or silage purposes than the latter, and the yields are larger on rich soils when the rainfall is fairly abundant. At the Massachusetts Experiment Station,* yields of 6 tons of hay and 67 bushels of seed to the acre are reported, while 20 tons an acre of green feed is not uncommon. Barnyard millet was more easily grown there than corn and made equally good silage. The New Jersey Experiment Station† found that an addition of 160 pounds of nitrate of soda to the acre not only produced a profitable increase in the total yield, but also increased the percentage of protein in the crop. This application should be made after the crop is well started, since in such form the nitrate is readily available and leaches out of the soil rapidly.

To obtain the best results, Barnyard millet should be seeded by the end of May. The seed ordinarily weighs 45 to 48 pounds a bushel and germinates well so that 16 to 24 pounds of seed an acre will give a good stand.

Barnyard millet deserves a wider use in New York State under conditions similar to those in Massachusetts. It does not do well on poor soil nor in dry situations, but on poorly drained land and on rich soils it is preferable to the foxtail millets or the prosos.

* Massachusetts State Bd. of Agr., 46th Ann. Rept. 1898, p. 329.

† Voorhees, E. B. New Jersey Exp. Sta. Bul. 164. pp. 10-13 (1903).

PROSO OR BROOM-CORN MILLET

This millet is probably native in Central Asia, but it has been grown under cultivation in Europe from prehistoric times and



FIG. 645.—A SINGLE PLANT OF PROSO OR BROOM-CORN MILLET.

is considered in that country as the "common millet." A loose-panicle form of it is shown in Fig. 645. The prosos can be logically divided into three botanical groups:*(1) *effusum*, with very loose panicles; (2) *contractum*, with medium-loose panicles; and (3) *compactum*, with dense panicles. These forms may be agriculturally described as (1) panicle prosos; (2) brush prosos; and (3) club prosos.

There are many agricultural varieties available in the United States, among the most important of which are the Black Veronezh, Red Orenburg, Tambov, Manitoba, Early Fortune, Red Russian, Red Veronezh, Red Lump,

and Turghai. Tests made by the U. S. Department of Agriculture have shown the Black Veronezh, Tambov, and Red Orenburg to be about the most reliable varieties.

In Asia and Europe, especially in Russia, proso is grown as a cereal crop, being very seldom used for forage. In America it is most important in North Dakota, South Dakota, eastern Montana, and Manitoba, but can be produced successfully farther south in Nebraska, Kansas, Colorado, and Wyoming, and east in Minne-

* Piper, C. V. Forage plants and their culture, p. 295 (1914).

sota and Iowa. It has never been popular in New York or other parts of eastern United States. Its value is greatest as a substitute for corn in regions too dry or too cold to produce the latter crop successfully. Proso has been utilized as a forage crop to a much greater extent in the United States than it has in Europe or Asia, but it is recognized here as the one distinctly grain millet. Yields of 15 to 30 bushels of seed an acre are normally obtained in the states where it is most largely grown.

For forage, proso is not so desirable as the foxtail millets, the yield being less as a rule and the hay inferior in quality. The plants are not so leafy and the rough, hairy leaf sheaths make the hay less palatable. In New York it cannot be recommended except for the driest hillsides, where other crops will not thrive. A limited amount of seed grown in such situations might be disposed of at a profit to manufacturers of poultry and bird feeds in the larger cities. The low freight rates from Europe, however, enable these manufacturers to import seed at a very reasonable cost and much of the seed used in such prepared feeds is obtained in that way.

The culture of proso is essentially the same as that of foxtail millet. In the dry climates of the Northwest 10 to 15 pounds of seed an acre is the customary amount sown, but in New York 20 to 25 pounds an acre would not be too much.

PEARL MILLET OR PENICILLARIA

This millet is probably native of Africa, for numerous varieties of it were found by the earliest travelers under cultivation there. In India, though second in rank to the sorghums, it is grown extensively under the native name of "bajra." In 1882-83 India had 12,382,939 acres of pearl millet as against 16,740,439 acres of sorghum and 18,524,704 acres of wheat.

Pearl millet is a tall, erect-growing annual grass, 6 to 15 feet high, with rather slender stems and numerous long, narrow leaves. It stools freely from the basal joints and also branches from the upper internodes, producing heads (Fig. 646) on the branches as well as the main stem. In general appearance pearl millet resembles the sorghums and corn more than it does the other millets.

This crop is adapted to the same climate as the sorghums and does best in the southern states because no early varieties of it have

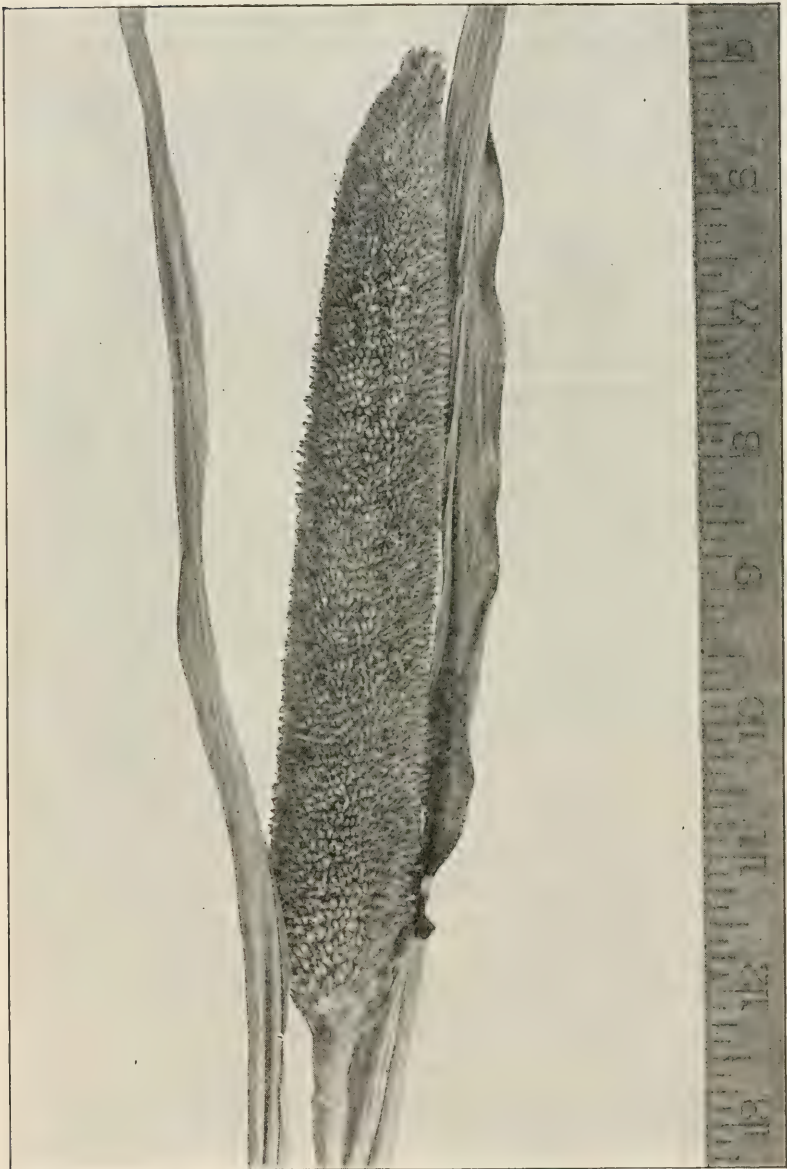


FIG. 646.—A SEED HEAD OR PANICLE OF PEARL MILLET. SCALE ON THE RIGHT GRADUATED TO INCHES AND FRACTIONS THEREOF,

yet been developed. It is best suited to rich, moist soils and under such conditions will produce enormous yields of forage. When harvested as a soiling crop, cutting it from three to six times during a season, yields of 10 to 40 tons an acre of green material are reported. When cut and cured as a fodder or hay crop the yields recorded are from 3 to 10 tons an acre. Such high yields can only be obtained, of course, under the most favorable conditions of soil and climate.

The culture of pearl millet is very similar to that of corn or sorghum. It is most commonly planted in rows 3 to 3½ feet apart; when the crop is to be used for soiling purposes, the plants are best spaced 3 to 6 inches apart in the row, but if it is to be cut for hay or fodder, it is better to drill thickly in the rows. When planted thinly, it stools abundantly. The seed usually does not germinate strongly, and 3 to 4 pounds an acre are required for the thinner plantings, and 6 to 8 pounds an acre when drilled thickly in the row.

In some cases pearl millet is drilled or broadcasted like the foxtail millets and harvested for hay with a mower and rake. For such seedings 30 to 35 pounds of seed an acre are required; whichever method of seeding is used, care must be observed not to plant the seed too deeply. Unless the soil is very loose and sandy, one-half inch is deep enough to cover the seed. The seed of pearl millet weighs from 48 to 56 pounds a bushel, therefore the average weight for each bushel runs about the same as for the other millets. Good seed yields are not often obtained in this country because for some reason a large percentage of the flowers prove sterile and do not form seed. Birds are very fond of the seed, and it is almost useless to attempt seed production in localities where the English sparrow or the reed birds are numerous.

In feeding value the stover of pearl millet has been found inferior to that of the sorghums or corn, and analyses show the mature plant to contain a high percentage of crude fibre, hence it is probably less valuable for silage purposes also.

There is little to recommend pearl millet to the New York farmer because he has better soiling crops, and there is no other capacity in which the pearl millet can compete with corn, timothy, foxtail millet, and other standard crops of the state.

THE SORGHUMS—THEIR USE AS FORAGE AND GRAIN CROPS IN NEW YORK

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INTRODUCTION

The group of plants included under the botanical name, *Andropogon sorghum* (L.) Brot. or *Holcus sorghum* L. is one of immense importance in the Old World, and, on account of their ability to withstand drought, will become a leading crop in the semiarid regions of the United States where it is too dry for Indian corn.

Many botanists have considered Johnson grass (*Andropogon halepensis*), a perennial plant with rootstocks, as the original type of our cultivated sorghums that are annuals. However, wild forms of sorghums have been found in Africa that are annual and are without rootstocks. Examples of these are Sudan grass and Tunis grass, two forage plants lately introduced into the United States. Several other wild grasses similar to these are known to exist in Africa. Sudan grass and Tunis grass cross very freely with the cultivated sorghums, while it is rather difficult to make a cross between Johnson grass and sorghum. It is reasonable to suppose, therefore, that these annual forms are at least the immediate progenitors of our cultivated sorghums.

The culture of sorghum is prehistoric. Figures representing some variety of sorghum were found on Egyptian ruins dating from about 2200 B. C., and they are known to have been grown in China and India at almost the beginning of the Christian era. The sorghums very likely originated in Africa and spread from there to Asia and Europe, a great diversity of forms developing through cross-pollination and selection. Sorghum was brought to the West Indies under the name "Guinea corn," and is reported * to have been under cultivation in the Carolina Colony

* Lawson, John. A History of Carolina, p. 76 (1718).

in 1700, having been brought there by traders from the West Indies.

Broom corn was grown in colonial times, and "Chinese sorghum," a sweet variety much like the Black Ambers that we now have, was introduced from France in 1853 and widely distributed by the United States Patent Office in 1857. Since 1857 numerous varieties have been introduced into this country — mainly by the United States Department of Agriculture — and the crop has become of considerable importance, especially in the semiarid regions.

The statistics regarding the acreage of sorghums in the United States are very incomplete because almost all of the sweet sorghums harvested for fodder are reported under "coarse forage," which includes corn fodder and other coarse forage plants, as well as the sweet sorghums. The Thirteenth U. S. Census (1909) gives the acreage of sorghums not included under "coarse forage" as follows:

Sorghum for sirup	444,089	acres
Broom corn	326,102	"
Kafir and milo.....	1,635,153	"
	2,405,344	acres

Very few states report in detail the sorghum acreage through their State Board of Agriculture. Where this is done, as it is in Kansas, the importance of the sweet sorghums in comparison with the other groups is apparent. In 1910 the sorghum acreage in Kansas was as follows: sorgo, 512,621; kafir, 636,201; milo, 100,700. Only 12,879 acres of the sorgo were used for sirup purposes.

In New York the sorghums have never been popular and they can be recommended only for forage purposes. As a grain crop they cannot compete in this rather cool and humid climate with corn, wheat, and oats. They can be utilized profitably, perhaps, on some of the drier soils when a soiling or quick-growing hay crop is needed. For this purpose some of the earlier-maturing varieties of sorgo are best.

Sorghum is probably the most variable of any of the cultivated field crops. Several attempts at classification have been made, but the continued cross-pollination that takes place when the

different groups or varieties are grown in close proximity to each other sets at naught all such work. The commonly cultivated varieties may be placed in groups that are fairly distinct, but when all the available forms are brought together, these groups are found to overlap or merge into each other through a multitude of intermediate forms. In the following discussion only the well-known varieties are considered and these are treated under their customary classes, which are sorgo or sweet sorghum, kafir, milo, durra, kaoliang, broom corn, and grass sorghum.

SORGO OR SWEET SORGHUM

This group described in many publications as the saccharine or sweet sorghums, is usually referred to by farmers as "cane," a term that has been applied to the sugar canes of the tropics for many years. In the southern states, where the sweet sorghums and the sugar cane are both commonly grown, the application of the term "cane" to both crops leads to confusion. "Sorgo" has, therefore, been suggested as a class name for the sweet sorghums.

The sorgos are characterized by their sweet, juicy stems, which fit them primarily for forage and sirup purposes. The seeds in this group have considerable tannin, a property which lessens their feeding value.

Black Amber

This variety seems to have originated in China. It was brought to the United States from France under the name "Chinese sorghum." It is characterized by its tall stems; rather narrow leaves; loose, pyramidal head; and large, flattened, reddish-yellow seeds, which are almost covered by the black, shiny glumes. Black Amber sorgo is found on the market under the names Minnesota Amber, Early Amber, and Dakota Amber. These are distinct strains which have been developed from the original Black Amber or Chinese sorghum by selection principally for earliness.

Minnesota Amber, the best known of these strains, matures in from 75 to 90 days, and is adapted to the northern states, being one of the safest varieties to plant in New York.

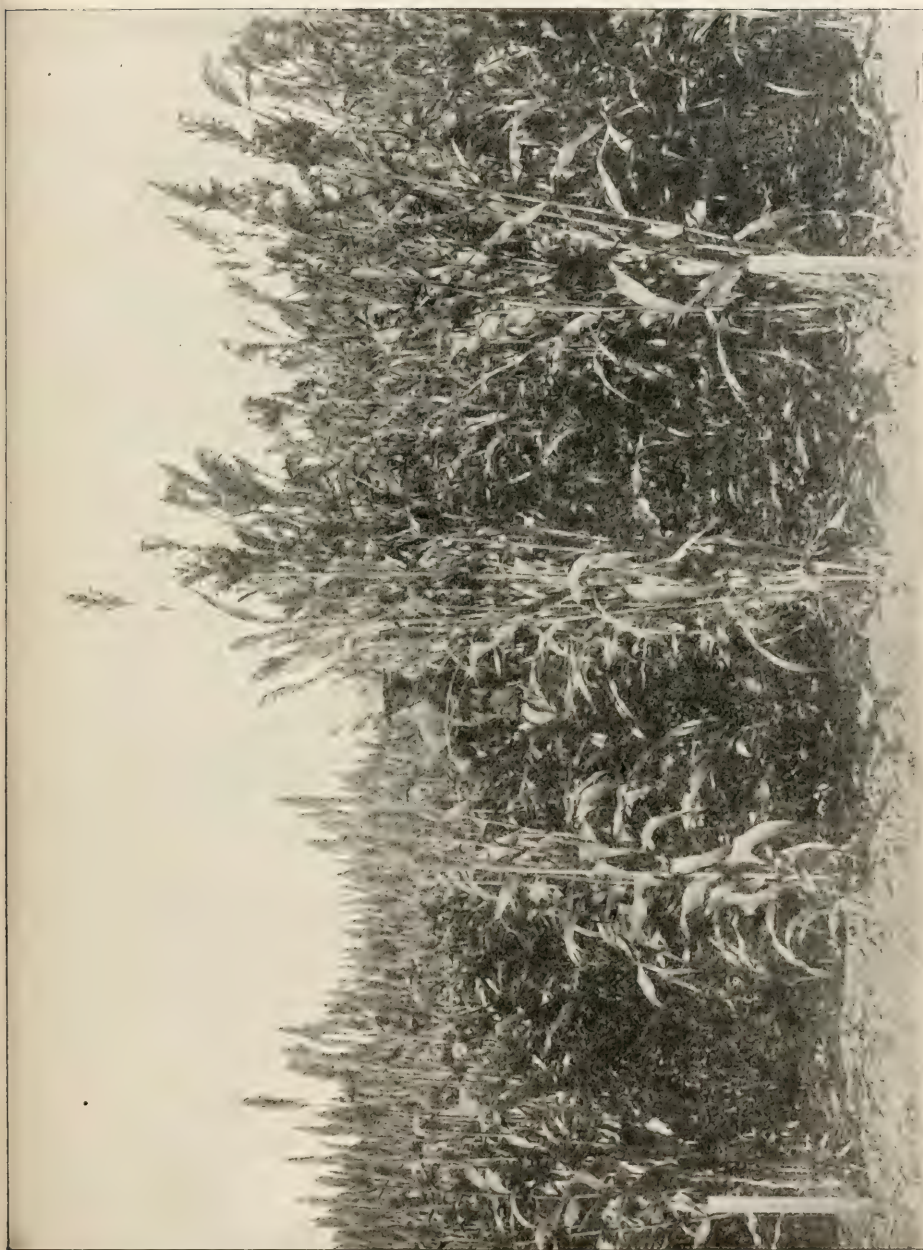


FIG. 647. DWARF KAFIR ON THE LEFT, AND RED AMBER SORGO ON THE RIGHT, TWO VARIETIES WHICH WILL MATURE IN NEW YORK.

Dakota Amber is even earlier than the preceding variety. It is dwarf, seldom attaining a height of more than five or six feet, and is of especial value in the northern Great Plains.

Red Amber

This variety was introduced in the United States in 1903 from Australia, where it is called "Early Orange." It is characterized by slender stems, numerous leaves, and medium loose head about intermediate in compactness between that of the Black Amber and the Orange varieties. The seeds resemble those of Black Amber in size and color, but are somewhat narrower. The glumes, which are dark red, nearly cover the seed, giving the head a red color. This variety is a trifle later than Minnesota Amber, requiring from 80 to 100 days for maturity. It yields well and makes an excellent quality of fodder. (Fig. 647.) Red Amber can be recommended for planting in New York along with Minnesota Amber and Orange, but seed of that variety is difficult to obtain.

Orange

Orange sorgo was one of the forms introduced from Natal, South Africa, in 1857. It has a stout stem and rather broad leaves, but is not so leafy as Sumac sorgo. The heads are more compact than those of the Black or Red Amber varieties, and reddish brown in color. The seeds are large and flattened like those of the Black Amber, but protrude much farther from the glumes, which vary in color from reddish brown to black. Orange sorgo requires about the same or a little longer season for maturity than Red Amber, being from one to two weeks later than Minnesota Amber. It is a good fodder variety and can be matured in New York in the average season, but will sometimes be caught by frost.

Sumac

This variety, which is often called Redtop, was also introduced from Natal, South Africa, in 1857. It is one of the sweetest and leafiest of the sorgos and is more uniform than most other varieties, varying little in appearance from year to year. The stem is rather stout, of medium height, and very leafy, bearing from fourteen to sixteen leaves. The head is very compact, stiffly erect,

and brownish red in color. The seeds are rather small, extruded more than 50 per cent, and brownish red on the exposed portion. The glumes vary in color from red to black. Sumac sorgo requires 108 to 120 days for maturity and is of value only in the southern half of the United States. It should not be planted in New York.

Honey

The origin of this variety, which is known also as "Japanese Cane" and "Japanese Seeded Ribbon Cane," is unknown. It is tall, leafy, very juicy, and very sweet. Both in quality and in amount of juice it ranks as one of the best sirup sorghums. The head is erect, but quite open and spreading in habit and light red in color. The seed are elliptical in shape and are nearly enclosed by the shiny red glumes. Honey sorgo requires a longer period for maturity than Sumac, and should be planted only in the southern states.

Gooseneck

This variety has also been sold as "Texas Seeded Ribbon Cane." It is very likely one of the varieties obtained from Natal, South Africa, in 1857, but the records are clear only as far back as 1876. The stems are juicy, stout, and very tall, it being about the largest of the commercial varieties. None of the other sorgos will make as high yields of silage as the Gooseneck. In large fields the stems often average 12 feet in height and from 1 to 1½ inches in diameter. The heads are rather compact and shaped much like those of milo. Many, though not all, of the heads are recurved or inclined at maturity. The seeds are yellowish brown and almost enclosed by the black glumes. Gooseneck is later than Sumac, maturing in about the same season as Honey. It is valued more for sirup than for forage except in making silage. It is too late in maturing to be of any value in New York.

Planter

This variety is known also as "Planter's Friend" and as "Sourless." It is quite popular in Australia, but has not been very well liked in the United States. It resembles Orange sorgo more than the other varieties described, but can be distinguished from the latter variety by its straw-colored seed and glumes. It is

also less sweet and juicy than the Orange, and, as it lodges badly in storms, it is not so valuable a variety. The heads are fairly compact, but often spreading at the tip. The glumes are pale brown or straw color and very pointed, and they about half enclose the straw-colored grains.

There are several other varieties that are offered by the seedsmen from time to time, but none are of much importance. Among those that may be named are the Collier, McLean, Colman, Freed, Sapling, Dwarf Ashburn, and Florida. The Collier is a very distinct variety with a head like a very small broom-corn panicle. In stem, leaf, and season of maturity it resembles the Orange. The McLean resembles Minnesota Amber, but is considerably later in maturing. Colman is much like the Orange in both plant characters and maturity. The Freed is a very early, dwarf, white-seeded sorgho, resembling Dakota Amber in type of plant, but less leafy. Sapling sorgho resembles the Planter in color of the head and seed, but is otherwise more like Orange.

KAFIR

This group of sorghums is unfortunately referred to in many cases as "kafir corn." They are stout-stemmed, very leafy sorghums, with stiffly erect, rather compact, cylindrical heads. (Fig. 648.) The stems are medium juicy and slightly sweet; the seeds are small, round in outline, rather hard and flinty in texture, and in most varieties comparatively free from tannin. This combination of characters makes kafir quite valuable for both forage and grain.

Blackhull

This is by far the most valuable variety of kafir. It is distinguished by its rather dwarf stem; very broad, dark green leaves; and the black glumes or hulls on the seeds. The seeds are white in color, marked with scattering red and black spots on the exposed portion. Blackhull kafir matures in from 114 to 120 days.

Red

Next to Blackhull kafir this variety is perhaps the most popular. The heads are longer and more slender than those of Blackhull



FIG. 648. FROM LEFT TO RIGHT, TYPICAL HEADS OF SUMAC SORGO, ORANGE SORGO, PLANTER SORGO, MINNESOTA AMBER SORGO, RED AMBER SORGO, RED KAFIR, DWARF MILO, AND BLACKHULL KAFIR.

kafir, and the seeds are brownish red on the exposed portion, giving the heads a red appearance. The glumes or hulls are a dull, yellowish gray and cover not more than one-fourth to one-third of the seed. Red kafir matures eight to twelve days earlier than Blackhull, and is usually a little taller. It is considered by some to be more drought-resistant, although there is very little difference in this respect.

White

Some writers call this variety Whitehull to indicate more exactly its relation to Blackhull kafir. The stem and leaf characters are similar to those of Blackhull and the seeds are almost identical in appearance, but the glumes are greenish gray instead of black. The chief weakness of White kafir is the failure of the head to free itself entirely from the boot, or last leaf sheath. Remaining thus enclosed by the boot, the base of the head is often moldy and it also provides a breeding place for the green aphid. It is a trifle earlier in maturity than Blackhull kafir.

Pink

This variety perhaps originated as a cross between the Red and Blackhull kafir or between the Red and White varieties. It was only recently introduced from South Africa. Although in plat tests it usually outyields the other varieties, still, the difference in this respect is so slight that the Pink kafir is not likely to replace the better-known sorts. In habit of growth it is somewhat more vigorous than the Blackhull and the head is larger and looser, especially at the upper end. The seeds are of a delicate pink color and the glumes are dull, greenish gray like those of the White kafir. In date of maturity it is as late or later than the Blackhull.

Dwarf

This variety originated as a selection from Blackhull and is identical with that variety in all characters except its smaller size and its shorter season of maturity. It usually matures at a height of from 3½ to 4 feet, and is almost two weeks earlier than the parent variety. For New York conditions, Dwarf kafir is preferable to any of the other varieties.

MILO

This group of sorghums, often called "milo maize" and by some simply "maize," is characterized by rather slender, dry, pithy stems which are usually sparsely leaved. The heads are very compact and are oblong or broadly ovate in shape, the longitudinal diameter frequently being but little greater than the transverse diameter. Most of the heads are recurved, although many remain erect. The seeds are large, round in outline but decidedly flattened, and yellowish red or white in color. The glumes vary in color from greenish gray to reddish brown and black, and enclose not more than half of the seed. Milo is very closely related to durra in all its essential characters, and is valuable chiefly for grain purposes.

Dwarf milo

This is a selected leafy milo, which under ordinary conditions grows to a height of $3\frac{1}{2}$ to $4\frac{1}{2}$ feet. Dwarf milo is very popular in the southern half of the Great Plains on account of its ability to make a reasonable crop of grain in years of drought when other crops fail. The stover is often used for roughage or pasture after the grain crop has been harvested. Dwarf milo is, however, only of minor importance as a forage crop and can not be recommended for New York conditions.

White milo

This is a white-seeded variety of milo which seems to have originated in India. It is almost identical with the yellow milos except that it has white seeds and either gray or black glumes. White milo seems to possess to even greater degree than Dwarf milo the ability to mature crops of grain under conditions of scanty rainfall.

Besides the two above varieties, considerable seed of the Tall or Standard milo is handled by seedsmen. This variety is not so desirable, however, as the Dwarf milo.

Milo is practically immune from both kernel smut and head smut, but is injured more than any other sorghum by chinch bugs.

DURRA

This group, like the milo, has dry, pithy stems and comparatively few leaves. The lower four or five usually become dry and

fall off before the plant matures. The heads, in most cases, are very compact, in shape resembling those of the milo. The seeds of most varieties grown in the United States are white, but there are brown and red-seeded varieties in Africa and India. The glumes are usually gray and somewhat pubescent; black-glumed forms are also common.

The first varieties of durra to be grown in this country were all white-seeded forms with recurved heads. One of these, which became of some importance in Kansas and other central states, was known as "Jerusalem corn." Others were called "Egyptian durra" and "White durra." None of these forms are of any value in comparison with Blackhull kafir, Dwarf milo, and Feterita.

Feterita

This variety, which has also been called "Sudan durra," is about the only variety of any importance in the United States, and it is so different from the other durras that there is reason to feel that it should be placed in a separate group. It was brought to the United States in 1906, from the Sudan region of Africa. In Feterita the heads are erect and the stems slightly sweet, although scarcely juicy. The seeds are bluish white, larger than those of milo, and also softer. The glumes may be either greenish gray or black. Feterita is noted for its earliness and drought resistance, and is valuable as a grain and silage crop, but can not compete with kafir as a fodder plant.

Shallu

This sorghum is usually classed with the durras, although quite distinct. It is grown quite extensively in southern California and other parts of the Southwest under the names, "Egyptian wheat," "rice corn," "California rice-corn," etc. Shallu has tall, pithy stems, lacking both juice and sweetness. It is fairly leafy and the head is loose and drooping. The seeds are quite hard and yellowish white or buff in color, held loosely by the spreading and involute glumes. The seeds shatter freely when ripe. This sorghum is of little value for forage and very few sorghum growers prefer it to kafir and milo for grain production.

KAOLIANG

This group of sorghums, which has been developed in Manchuria, Korea, and northern China, is found described in literature under the names "kaoliang," "kowliang," and "gaolan." They are dry-stemmed sorghums, rather sparsely leaved, with widely varying colors in the glumes and seeds. The heads are quite compact in some varieties and very loose in others. The glumes are thin and papery and usually distinctly veined. The seeds have a curved point or hook at the apex, which somewhat resembles that on the seeds of the sweet sorghum, although more pronounced. The kaoliangs are primarily grain sorghums and seem likely to be of value only in the northern Great Plains where other sorghums will not mature and where it is too dry for corn.

Numerous varieties of kaoliang have been introduced by the United States Department of Agriculture, but none of them promise to become valuable in New York. Twenty-seven varieties have been described and classified by Mr. C. R. Ball in United States Department of Agriculture Bureau of Plant Industry Bulletin 253. This bulletin gives a very complete discussion of this group of sorghums.

The most valuable kaoliang varieties for the United States are the Manchu Brown, a rather dwarf, early variety, maturing in 85 to 105 days, and the Valley Brown of medium height, also early, maturing in 95 to 105 days. These are both brown-seeded varieties. The Barchet Blackhull is one of the best of the white-seeded varieties.

BROOM CORN

This group of sorghums, on account of its special use, is not often considered among the sorghums by farmers. It differs little from the kaoliangs, however, except in the head or panicle, which has a very short central axis and very elongated branches, thus providing a "brush" which is suitable for the manufacture of brooms. Broom corn was grown at a very early date by the colonists along the Atlantic coast, but is now most important in the Central West.

There are three principal varieties of broom corn — Standard, Dwarf-standard, and Dwarf. These, as the names indicate, are

respectively tall, medium, and low-growing varieties. The culture of broom corn is the same as that of sorghum. The harvesting or topping is usually done by hand, but in some cases with machinery. Thrashing or cleaning of the straw is accomplished by means of special machines, after which the brush or broom straw is baled and sold to broom manufacturers. After topping, the stalks furnish considerable pasture.

GRASS SORGHUMS

The only member of this group of sorghums that is now important in the United States is Sudan grass. This new field crop was introduced into the United States from Sudan, Africa, in 1909, and very few other plant introductions have sprung into such instant popularity. It is of most importance in the southern states, but can be grown successfully as far north as central New York.



FIG. 649. ROOT OF SUDAN GRASS SHOWING THE ENTIRE ABSENCE OF ROOTSTOCKS.

Sudan grass resembles very closely the Johnson grass that is so abundant in the southern states, but does not have the underground rootstocks of the latter plant. (Fig. 649.) It grows to a height of six to ten feet in cultivated rows, but when broadcast thickly

it is usually not more than four or five feet high and can be handled like any other hay plant, except that it is quite succulent and when cut for hay more time is required for curing it than for

timothy or millet. The yield should average about two tons an acre and the hay is of better quality than that of the foxtail millets. Sudan grass will never be as popular in New York as it is in the South and Central West, but where a quick-growing catch crop is desired to overcome an indicated shortage of hay, Sudan grass is recommended for trial. (Fig. 650.) Additional information regarding this grass will be found in United States Department of Agriculture Farmers' Bulletin 605.



FIG. 650. BUNDLES OF SUDAN GRASS SHOWING GROWTH AT 70, 55, 42, 27, AND 13 DAYS FROM THE DATE OF SEEDING.

PLANTING

Sorghum should not be seeded until the soil is thoroughly warm in the spring. This is usually a week or more after corn has been planted. When seeded earlier imperfect stands often result, because sorghum seed does not germinate readily in cold soils, much of it decaying under such conditions. Later seedings

can be made at any time during the summer when moisture conditions are favorable and there is time enough for the crop to mature before frost.

Sorghum is best planted with an ordinary corn planter in rows 36 to 44 inches apart on land which has been given the same preparation as for corn. Special plates with holes arranged to drop the required amount of seed can be obtained for most corn planters. In rows this distance apart, 4 to 6 pounds of seed will be found ample unless it is very low in germination.



FIG. 651. DAKOTA AMBER SORGHUM SEEDED WITH A GRAIN DRILL FOR USE AS A HAY CROP.

Sorghum intended for a grain crop should be planted thinner than when intended for forage. Planting in furrows with a lister is recommended only for the semiarid regions.

The sorghos, or sweet sorghums, are sometimes sown broadcast or with a grain drill. (Fig. 651.) For such seedings it is best to use 1 to 1½ bushels of seed to the acre so that the stand will be sufficiently thick to make the stems of the plants slender. When fine-stemmed, the crop can be handled with a mower and rake much better than if allowed to become coarse.

Sudan grass should be planted in New York at about the same time as the other sorghums. For hay purposes it is best sown broadcast or with a grain drill at the rate of 25 pounds of seed per acre. In the drier climates it is often planted in rows 3½ feet apart and cultivated like corn. This method is best in all cases when a seed crop is desired.

HARVESTING

Sorghum intended for fodder should not be cut until the seed has reached the early dough stage; if cut earlier than this, the greatest value of the crop is not obtained. When the crop is to be used for silage, it should be allowed to stand until the seeds become hard. Mature sorghum makes good silage, very little, if any, more acid than corn silage, but if cut too soon it is apt to sour in the silo. Most of the unfavorable results with sorghum silage arise from this failure to allow the crop to ripen sufficiently before cutting. When the seed only is desired and it is gathered by topping the plants in the field, the crop must be allowed to stand until the stem just below the head becomes dry. If the seed crop is cut with a row binder or other machine after the manner of harvesting for fodder, it can be cut as soon as the seed becomes hard enough to crack in the teeth. Handled in this way, the stover is of considerable value for roughage after the seed has been removed.

Sorghum grown in cultivated rows can be harvested for fodder with an ordinary row binder such as is used in cutting corn. (Fig. 652.) Where this tool is not available and the acreage is small, the corn knife can be used. The same methods are applicable when the crop is being harvested for silage purposes, and a seed crop can be saved in this way by topping the bundles after they have cured in the shocks.

The fodder, on account of its succulence, must be allowed to cure for some time in the field like corn fodder before it is stacked or stored in the barn. (Fig. 653.) Sorghum, either in bundles or as loose hay, turns the water well, hence there is little loss from spoiling in the stack.

When sown broadcast or in close drills, sorghum is usually cut with a mower and cured like other hays. In the dry climates of



FIG. 652. HARVESTING SORGHUM WITH A ROW BINDER FOR FODDER PURPOSES.

the West, however, many farmers cut their broadcast sorghum with a grain binder. This method is preferable whenever it can be cured in bundles, as it is much easier to handle.

In New York, sorghum can be cut only once for fodder or hay; but in the southern states two, and sometimes three, cuttings are obtained in a season, as new shoots develop quickly from the stubble and make a rapid growth. This feature makes sorghum rather valuable as a crop to be used for soiling purposes. For green feed it can be cut at any time after it is two or three feet high, but it is better not to cut until after the plants are in head. The average yield of green forage is no doubt above 15 tons to the acre, although no accurate figures are available.

A considerable part of the sorghum acreage harvested for grain alone was formerly topped in the field by cutting the heads off with a knife. Several machines designed to facilitate this process have been developed, some of which can be attached directly to an ordinary wagon box. The most effective way of gathering the heads of grain sorghums, especially where they are erect in growth, is to raise the platform of an ordinary grain header to the proper height and cut the crop with that machine.

Care must be used when the heads are gathered separate from the stalk to prevent them from heating in the granary or cribs, otherwise the germinating power of the seed will be lowered or destroyed entirely. It is necessary to store the seed heads in narrow ricks under cover, or in cribs having open sides with ventilators at frequent intervals underneath. The seed can be thrashed in an ordinary grain separator by removing part of the concaves and decreasing the speed of the cylinder. If these adjustments are not made, a great many seeds will be cracked; and, while this does not injure their feeding value, it does lower their germination. Cracked and poorly cleaned seed is much more apt to heat during shipment than is that which has been properly thrashed.

The varieties of sorghum more especially adapted to grain production, such as kafir, milo, feterita, and kaoliang, commonly yield 20 to 30 bushels an acre, but yields of 80 and 90 bushels an acre are frequently reported. The sweet sorghums which have not been developed for grain production ordinarily yield less seed. The seed of sorghum varies in weight from 55 to 60 pounds a

bushel, probably averaging 56 to 58 pounds, although the legal weight in many states is only 50 pounds a bushel, and in a few states it is as low as 30 pounds.

FEEDING VALUE

Sorghum fodder has about the same feeding value as corn fodder, but is usually to be preferred on account of the greater percentage of leaves and the higher sugar content of the stems. It is a very effective roughage for stock cattle, even though some of the stems are left by the stock. The hay produced from broadcast seedings is rather coarse, but very palatable, and has a chemical composition about the same as that of timothy. For work horses



FIG. 653. SORGHUM FODDER CURING IN THE SHOCK.

it is not so good as timothy or prairie hay, because it has a slightly laxative effect.

The seed of kafir, milo, and feterita has been used as a grain feed with good results for all classes of live stock. The general opinion among practical feeders is that sorghum grain is about 90 per cent as valuable as corn when used for fattening cattle or hogs, and feeding tests carried on at experiment stations seem to substantiate this opinion fairly well. The protein content is somewhat higher in sorghum grain than in corn, hence the difference in

the effectiveness of the two feeds is probably due to the less amount of fat in the sorghum grain.

POISONING

Sorghum is used very little as a pasture on account of the danger of prussic acid poisoning. This poison seems more apt to form in the leaves of sorghum when the growth of the plant has been checked for any reason, as by frost or an acute spell of drought. Many cases of poisoning are reported in pasturing second-growth sorghum — in fact any abnormality in the growth of sorghum seems to increase the danger of poisoning. On the whole it is not safe to pasture immature sorghum, and care should be used in feeding it green. The mature plant, especially when the growth is normal, is rarely dangerous; and sorghum from which a seed crop has been harvested can usually be pastured with perfect safety. Curing the plant either as fodder or hay also appears to eliminate the poison. Only one or two well-authenticated cases of poisoning from the use of sorghum fodder are known, and these hardly seem sufficient to warrant any restraint in feeding the cured plant.

DISEASES

There are three diseases that cause more or less damage to sorghums, and no adequate remedy for two of these has yet been discovered.

Kernel smut

This disease affects the individual grains of the sorghum head. The general appearance of the head is very little changed, but most of the seeds in an affected head are destroyed. It can be controlled by treating the seed with formalin or hot water before planting, page 2758.

Head smut

This disease destroys the entire head of sorghum in much the same way as ear smut does the ear of corn. When the head emerges from the sheath it is a mass of spores covered by a whitish membrane. No effective way of preventing this smut has been found.

Red-spot or blight

This disease is characterized by somewhat circular or elongated red spots on the leaves and leaf sheaths. These spots appear much like rust spots to the ordinary observer and when abundant the affected leaf dies prematurely. This disease is most prevalent in humid regions and is especially destructive to Sudan grass. Selection of resistant varieties is the only method of control known at the present time.

INSECT PESTS

The most important insect pests of sorghum are the sorghum midge, the chinch bug, the grasshopper, and the fall army worm.

Sorghum midge

This minute reddish fly lays its eggs in the sorghum flower when it is in bloom and the young larvae feed on the juices of the developing ovary, thus preventing the formation of the seed. The sorghum midge is abundant only in the warm, humid portion of the United States from Texas east to Florida. In this section it renders the production of profitable seed crops very nearly impossible. Very early or very late planting, thus causing the sorghum to reach the blossoming stage at a time when the midge is not abundant, are the most practical ways known to escape the ravages of this insect.

Chinch bug

These bugs, when abundant, do considerable damage to young sorghum plants. They are especially fond of milo and often leave kafir and the sweet sorghums almost untouched while they devour an adjacent field of milo. The methods used to prevent attacks of chinch bugs on the small grains can be used to protect the sorghum crop.*

* The chinch bug, only about one-fifth of an inch long, stout, black and with white wings, is one of the most serious insect enemies of grasses, small grains, and corn in the Central States, especially in the somewhat dry climate of Kansas. It produces two generations annually, the second frequently invading adjacent cultivated fields and attacking sorghum as well as corn and other grains in August or September. Injury by this pest in New York State is occasional and confined largely to timothy meadows, this being especially true in the St. Lawrence and upper Hudson valleys. The bugs may become so abundant as practically to destroy the timothy late in the season, and portions of fields producing heavy crops one summer may be almost barren the next.

Slow burning when the vegetation is dry will destroy most of the hibernating bugs at the base of the grasses and is advisable for roadsides and fence-side thickets. Burning of timothy meadows is not recommended because there is danger of injuring the grass. A moderately frequent rotation will do much to keep the pest from becoming excessively abundant. Chinch bugs spread by crawling to nearby fields, and consequently some care may well be exercised not to plant near grassy land those crops likely to be injured, as such land is frequently badly infested with this pest. However, it is not difficult to protect fields from invasion by the use of barriers, such as dusty furrows, trips of tar, or similar devices.—*Dr. E. P. Felt, New York State Entomologist.*

Grasshopper

These insects are not apt to be destructive to sorghum in New York and other eastern states, but they sometimes do considerable damage in the Great Plains, stripping the leaves from the plant and preventing its further development. Scattering poisoned bran is the best method of destroying grasshoppers.

Fall army worm

This insect, when abundant, may do serious damage. The larvae feed on the young leaves while they are still coiled, perforating them so badly in some cases that they break off when they are expanding.

The sorghum aphid and the corn worm both attack sorghums, but neither do any great damage.

CONCLUSIONS

Sorghum is not a crop of any importance in New York, chiefly because climatic conditions are not so well suited to it as to other crops like corn and the small grains.

It may be grown to advantage as an emergency forage crop in the drier locations, and for this purpose the earlier varieties of sweet sorghum, such as Minnesota Amber, Red Amber, and Orange, are recommended for fodder, and Sudan grass for hay.

NOTE.—Additional information regarding sorghum can be obtained from the following bulletins of the United States Department of Agriculture:

Saccharine Sorghums for Forage, by Carleton R. Ball. Farmers' Bulletin 246 (1906).

The Best Two Sweet Sorghums for Forage, by A. B. Conner. Farmers' Bulletin 458 (1911).

Sorghum Sirup Manufacture, by A. Hugh Bryan. Farmers' Bulletin 477 (1913).

The Nonsaccharine Sorghums, by C. W. Warburton. Farmers' Bulletin 288 (1907).

Milo as a Dry-Land Grain Crop, by Carleton R. Ball and Arthur H. Leidigh. Farmers' Bulletin 322 (1908).

Kafir as a Grain Crop, by Carleton R. Ball and Benton E. Rothgeb. Farmers' Bulletin 552 (1913).

Uses of Sorghum Grain, by Carleton R. Ball and Benton E. Rothgeb. Farmers' Bulletin 686 (1915).

CLOVER

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The term "clover" is somewhat loosely used and popularly includes not only the true clovers, but also such plants as sweet clover, bur clover, and Japan clover, which, while botanically quite distinct from them, have habits and agricultural value very similar to that of the true clovers.

BOTANICAL CHARACTERS

The true clovers belong to the genus *Trifolium*, one of the genera of the pea or bean family of plants. This family is characterized, among other things, by having flowers that are formed of a standard, two wings, and a keel — a type well known in the pea. Along with other genera, as those to which alfalfa and sweet clover belong, the true clovers have three-parted leaves; but they differ from these near relatives in having the flowers in heads and the seed in small, straight pods. All members of this genus are herbs; that is, they have no woody stems. Many of the species are annuals; others, as white and alsike clovers, are perennials; while some, as red clover, may be biennial or perennial, depending on the method of handling and the conditions under which they are grown.

GEOGRAPHICAL DISTRIBUTION

There are at present some 275 known species of *Trifolium*; fourteen of these grow wild in the northeastern states, while many more are found in the West and South, the extreme West being especially rich in species. The clovers are essentially plants of the temperate region, most of them being found in the North Temperate Zone, with a few in South America and in North and South Africa. Of the fourteen species found growing wild in the



FIG. 654. A SINGLE PLANT OF CRIMSON CLOVER.

northeastern states, at least half have been introduced from Europe and have become naturalized in our fields and along our roadsides. Among these are the four species of economic importance in the United States—red clover (*Trifolium pratense*), scarlet or crimson clover (*T. incarnatum*), alsike or Swedish clover (*T. hybridum*), and white clover (*T. repens*).

AGRICULTURAL HISTORY

The clovers were not cultivated by the ancients, so far as known, first coming into prominence in Europe during the late Middle Ages. Red clover was carried from Flanders to England in 1645 and was doubtless brought to America by early settlers, though there is no record of the fact. Jared Eliot wrote that it was grown in Massachusetts in 1747. The same writer says that white clover was common in Massachusetts at that time and it soon spread, so that in 1794 Strickland wrote that it was found "in every part of America—from New Hampshire to Carolina, from the sea to the mountains." *

Alsike and crimson clover have not been known so long in the United States, but are known to have been cultivated in Europe since the middle of the eighteenth century. Alsike clover is said to be a native of Sweden and to take its name from a place of that name. The United States Patent Office distributed seeds in 1854, but this is probably not the earliest introduction. Crimson clover is a native of Southern Europe, but is now grown from Italy to Germany, and also in England. The earliest record for the United States is 1818, "but its culture did not assume much importance till about 1880."† Today alsike clover is grown more or less throughout the northern states and to some extent west of the Rocky Mountains. It is of little importance in the South, where crimson clover has rapidly become the most important member of the genus.

CHEMICAL COMPOSITION

In common with all legumes, the clovers are especially rich in proteins and hence make a valuable feed. The table below, compiled from Henry and Morrison's *Feeds and Feeding*,† shows how clover hay compares with timothy.

* Piper, C. V.—*Forage Plants and Their Culture*, p. 412.

† Henry and Morrison.—*Feeds and Feeding*, 15th edition, p. 660.

DIGESTIBLE NUTRIENTS AND FERTILIZER CONSTITUENTS IN 100 POUNDS OF HAY

Clover	Dry matter	Crude protein	Carbon	Fat	Total	Nutritive ratio, 1:	Nitrogen	Phosphoric acid	Potash
Alsike.....	87.7	7.9	36.9	1.1	47.3	5.0	2.05	.7	1.74
Crimson....	89.4	9.7	36.8	1.0	48.7	4.0	2.26	.61	2.24
Mammoth...	81.3	6.4	37.2	1.8	47.6	6.4	1.73	.63	.87
Red.....	87.1	7.6	39.3	1.8	50.9	5.0	2.05	.39	1.63
White.....	91.9	11.8	43.3	1.5	58.5	7.4	2.59	.52	2.00
Timothy...	88.4	3.0	42.8	1.2	48.5	15.2	.99	.31	1.36

The above figures are averages and it must not be forgotten that there may be wide divergences from these. It has been shown that the fertility of the soil has much to do with the chemical composition, more nitrogen-free extract having been found, for instance, in clover raised on land heavily fertilized with potash. The time when the hay is cut also has an effect; red clover has been shown to contain most crude protein before bloom and least after bloom.

BIOLOGICAL RELATIONS

The relations of the clovers to their environment, that is, the soil and climate, vary somewhat with the species. Crimson clover is an annual and will not endure extreme cold or extreme heat. It is a plant that thrives in the cool weather of late summer and fall and early spring, hence it should never be seeded in spring, as it will promptly go to seed on the advent of warm weather; also, it can be successfully grown only where the winters are not too severe. In New York State, therefore, it is used but little, although it is planted as a cover crop in orchards and vineyards to a limited extent.

Red and alsike clovers are perennials, but the former is commonly treated as a biennial. Under otherwise favorable conditions they endure the winter well and are not seriously affected by the heat of a northern summer. They prefer relatively cool weather, however, and in the northern parts of Maine red clover thrives even on soils that would be considered unfavorable further south. Although both red and alsike clover will grow on a variety of soils, they must be well drained for red clover, while alsike is

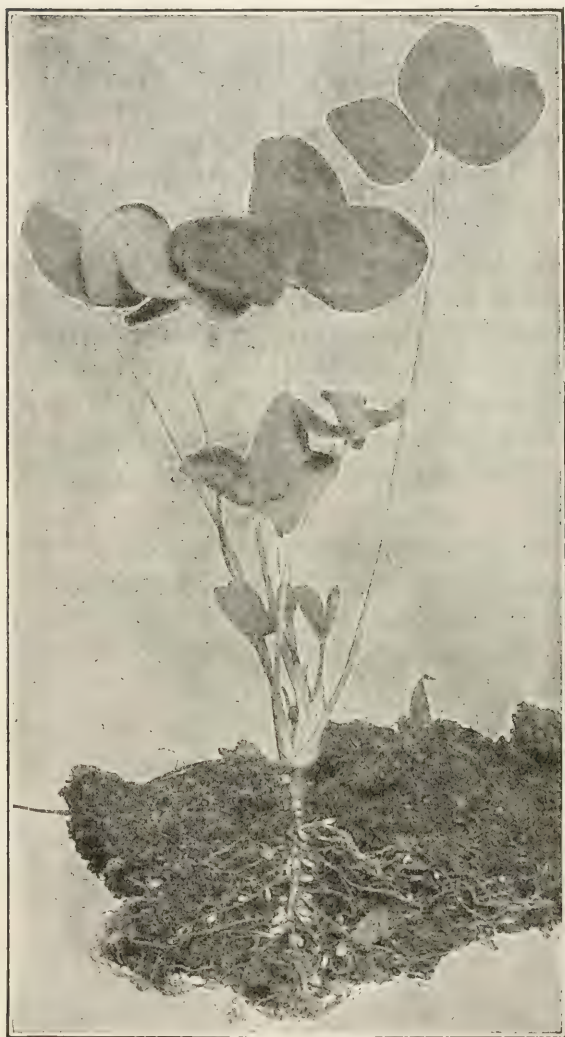


FIG. 655. YOUNG RED CLOVER PLANT, SHOWING
TUBERCLES ON ROOTS.

especially adapted to wet soils. All clovers require some lime, but it is most necessary for red clover and least necessary for alsike. This means that alsike can be grown on land too sour for red clover, and in many places it is replacing red clover for this reason. There is relatively more alsike grown in New York State than in any other.

White clover seems adapted to the widest range of soils and climate, growing more or less luxuriantly in all parts of the country, but this, too, does best on soils containing plenty of lime.

NITROGEN-FIXING

One of the important characteristics of all legumes is the power they have, through the association of certain bacteria, to take nitrogen from the air. One strain of bacteria is believed to be responsible for the nodules found on the roots of all true clovers, and, therefore, if one kind of clover has been grown on a certain field and has had nodules on the roots, other true clovers will also be inoculated. Sweet clover and bur clover, however, require a different strain — the same as is found in the nodules on the roots of alfalfa.

Not all of the nitrogen found in clover hay or roots comes from the supply in the air. It has been estimated that about one-third is taken from the soil and the remainder from the air. Since this is nearly the proportion which the roots bear to the tops, it follows that when all the leaves and stems are removed as hay the soil is neither materially richer nor poorer in nitrogen.

USES

The clovers are used for forage, and as cover and green manure crops. Under favorable conditions red clover will yield from one to three tons of excellent hay per acre, while the yield of alsike is generally smaller. Alsike hay is fine, however, and on wet or sour land it does better than red. Crimson clover is used more for a cover and green manure crop than for hay, though it makes good hay if cut early. Red clover is commonly cut for hay when the heads of the first crop are half brown. When in full bloom the hay contains more nutritive matter, but the later cutting is easier to cure. The second crop of red clover may be made into

hay or left for seed. The seed is commonly saved from this second crop. Mammoth clover, which is a late variety of red, makes but one crop. It is ready for hay at the same time as timothy, and is hence often preferred to sow with that grass. Alsike clover also makes but one crop in a season; this may be cut for hay or for seed.

IN ROTATIONS

Red clover is seldom used as a green manure, but it is the standard legume in the North for use in rotations. As such it is used either with or without timothy, and is the basis for maintaining the fertility of the soil. Corn and potatoes are planted on the turned-under clover sod, and this sod furnishes nitrogen for the hoed crop.



FIG. 656. CLOSE VIEW OF SOIL HONEYCOMED BY FROST AND IN PROPER CONDITION FOR SEEDING CLOVER. THE NUMEROUS IRREGULARITIES BECOME LEVELED WHEN THE GROUND THAWS, RESULTING IN A NATURAL COVERING OF THE CLOVER SEED BY THE SOIL.

SEED PRODUCTION

The seed of red clover is taken from the second crop and is gathered in nearly all of the northern states, but chiefly in those of the Ohio and Mississippi valleys and in Idaho and Oregon. The yield of seed is extremely variable; a wet season is commonly a

poor one for seed and the attacks of insects may reduce the crop to almost nothing. To determine whether a seed crop is worth harvesting, the seeds in a number of heads may be counted. If an average of 20 to 25 seeds are found per head and the stand is fair to good, the yield will probably be one to two bushels per acre. The crop should be cut when all the heads are brown and the seeds hard. In about four days, if the weather is favorable, the crop is ready to hull. It is not necessary to allow the straw to rot before hulling, as is often done. In the South crimson clover seed is often sown in the hull. The yield of red clover in the eastern part of the United States averages about one to two bushels per acre, although yields of five bushels have been recorded. In Idaho yields of five or more bushels are the rule. Much is also imported from Europe.

Alsike clover seed is harvested in relatively few northern states, New York, Michigan, Wisconsin, Idaho, and the Canadian provinces producing most. Crimson clover seed is very largely imported but is also raised in Delaware and various southern states. White clover seed is harvested in Wisconsin, Louisiana, and Idaho, and to a small extent in other places. Much of our supply comes from Europe.

POLLINATION

The red clover flower must be cross-pollinated to produce seed. Why the pollen from a given plant is sterile on the stigmas of flowers from the same plant we do not know, but many experiments have shown that seed is almost never set in self-pollinated flowers. Bees, especially bumblebees, are the main agents in cross-pollination, and this is perhaps one reason why a better crop of seed is set in a clear, dry season, when these insects are plentiful and active, than in a wet one.

GETTING AND KEEPING A STAND

In New York and other northern states, red clover is commonly seeded in spring on winter wheat or with oats—ten or twelve pounds of seed being used. If seeded on wheat the seed should be harrowed in; this will not hurt the wheat. In an average season the success of the seeding will depend on using good seed, on the care in working it in, and on the nurse crop not being too

thick. A nurse crop helps the clover only by keeping the weeds down, and if too thick it will have the same effect on the young clover.

On sour or run-down soils, lime or manure may be needed to give the plants a healthy start. If the season is dry just after harvest, there is sure to be heavy mortality among the young plants and they can withstand the drought better if on land well supplied with lime or humus. To keep a stand the plants must have a chance to grow strong and thrifty before winter. If the first season's growth is very heavy, as it may be in a wet season, the clover may be lightly pastured or clipped. It should not be allowed to bloom nor should it be pastured or cut close. To endure the winter the clover must have a fair growth to act as a mulch, but this must not be so heavy as to smother the plants. On practically all New York lands, lime is either necessary or helpful, and the application of stable manure will be found generally beneficial.

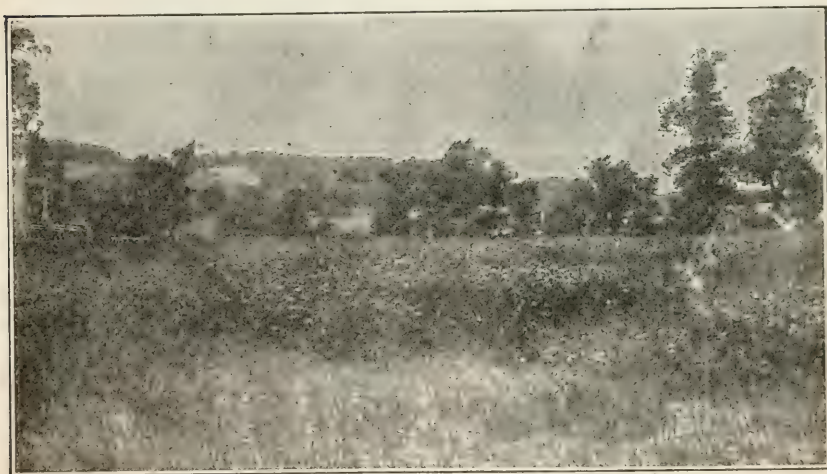


FIG. 657. RED CLOVER FIELD, SHOWING THE EFFECT OF TOP-DRESSING WITH MANURE. THE AREA IN THE IMMEDIATE FOREGROUND RECEIVED NO MANURE; THE AREA IMMEDIATELY BEHIND RECEIVED A LIGHT APPLICATION, RESULTING IN A VERY VIGOROUS STAND OF CLOVER.

WINTERKILLING, DISEASES, INSECTS

Winterkilling is usually caused by the heaving of the ground; a good mulch of the leaves and stems will go far to prevent this.

Winterkilling may also occur on land devoid of lime, on which land clover does not make a healthy growth.

There are several clover diseases but none are more than locally injurious, and when present there is nothing to do but cut what clover there is or pasture it and plow the field for another crop.

Of all the clover insects the root borer is perhaps the worst, and it is very generally prevalent in New York. This small beetle deposits eggs from which hatch small larvae and these enter the root and crown of the plant. When the injury is bad the clover wilts and dies. The attack is usually on the second season's clover and hence in New York State it seldom pays to try to keep red clover more than two seasons. Some leaf-eating insects may be locally serious and, if so, the crop should be cut or pastured at once. The greatest enemies to the seed crop are the clover flower midge and the clover seed chalcid. These are minute wasp-like insects which deposit eggs in the buds or in the young seeds. They are commonly present in both the first and second crop of bloom and the only remedy is to cut the first crop a week or two earlier than usual — that is, before full bloom. At this time the maggots are in the flowers but are killed by the drying of the hay, and there will be few mature flies to lay eggs in the second crop.

NOTE.—For treatment of clover diseases, see article entitled "Diseases of Alfalfa and Clover," p. 2898.

CLOVER INSECTS

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While over a hundred species of insects attack the clover plant, the greater part of the injury is caused by the seven treated in this paper. No part of the plant is exempt from attack: the roots are riddled by the burrows of the root-borer; the stem-borer tunnels the stems; the leaves are devoured by several weevils and caterpillars; plant-lice suck the juices from the plant above ground and mealy bugs cause a similar injury to the roots; a maggot destroys the ovary of the unopened flower and a grub devours the kernel of the seed; and even clover hay is often injured to a considerable extent by the clover hay-worm. While insect injury to clover does not often attract the grower's attention it is none the less real and constant. If it were possible to exclude the injurious species from our clover fields not only would the crop of hay and seed be greatly increased but it would also be possible to keep the fields in clover for several successive years. The root-borer has made the clover plant for all practical purposes a biennial instead of a perennial. Many clover insects also attack alfalfa, vetch, peas, and other plants of the same family.

THE CLOVER ROOT-BORER

Hylastinus obscurus Marsham

Undoubtedly the most serious insect enemy of clover in New York State is this small brownish-black beetle which in both the larval and adult stages burrows in the roots of the plant. The insect is a native of Europe where it has been known as a clover pest for over a century. It was probably introduced into New

York State in the late seventies and first attracted attention by its destructive work in Yates County in 1878. The introduction of this pest has had an important effect on clover-growing in the state because where the insect is present it has not been found practicable to keep fields in clover longer than the second summer after seeding.

In addition to red clover, the clover root-borer also attacks mammoth clover, alsike, and to some extent alfalfa and peas.

If one digs up a two-year-old clover root in late fall or early spring it will be found hollowed out by the longitudinal burrows of a small brownish-black beetle about one-tenth inch in length. (Figs. 658 and 659.) The insect passes the winter mostly in the beetle stage although occasionally a few of the grubs are found. In May or June the beetles leave the roots and fly to other clover plants, preferably those just beginning their second year of growth. The beetles usually burrow down through the crown, but they may occasionally enter the root from the side. The female deposits her minute, white, elliptical eggs along the side of her burrow, covering them with bits of refuse. The eggs hatch in a few days and the young grubs burrow lengthwise through the root, most of them becoming full grown the last of July, although some do not reach maturity until September. The full-grown grub is about one-eighth inch in length, white, with a yellowish head and brown jaws. It transforms to a white pupa at the end of its burrow. Most of the pupae change to beetles before the first of October. There is only one generation annually. When the root is badly infested the plant is severely injured, and if dry weather ensues the top



FIG. 658. CLOVER ROOT, SHOWING WORK OF THE BORER.

(Redrawn after Webster)

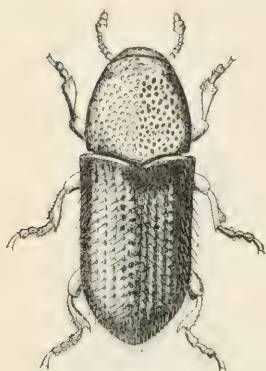


FIG. 659. THE CLOVER
ROOT-BORER BEETLE.
(Redrawn after Webster)

will wither and die. Even under the most favorable conditions the growth is badly stunted and the quantity of seed produced is greatly decreased.

Control. Under the system of clover growing practiced in New York little can be done to prevent injury by the root-borer. Something may be gained, however, by adopting a short rotation, by keeping the soil in good tilth, by maintaining a high state of fertility, and by underdraining wherever necessary.

THE CLOVER LEAF-WEEVIL

Hypera punctata Fabricius

While capable of doing serious injury under favorable conditions the clover leaf-weevil does not as a rule cause as much loss as the clover root-borer. This beetle is a native of Europe and was apparently introduced into North America about the middle of the nineteenth century, but did not attract attention by its injuries to clover until the early eighties when it was reported as destructive in Yates County, N. Y. It is now widely distributed throughout the state and every year causes more or less loss, although serious outbreaks are usually local in extent and rarely continue from year to year in the same locality.

The insect passes the winter in the larval condition, most of the larvae being in the earlier stages. With the advent of warm weather in the spring these grubs begin feeding on the clover leaves and complete their growth by about the middle of June. The full-grown larva is one-third to one-half inch in length, green in color with a light stripe down the middle of the back; the head is brownish. The grubs feed mostly at night and during the day can be found curled up under the rubbish around the base of the plant. The younger grubs eat small holes through the leaves and the older ones devour larger areas, beginning at the edge of the leaf. When full-grown, the grubs spin curious open-work cocoons of yellowish to brownish silk within which,

after a few days of preparation, they transform to greenish pupae with black eyes and yellowish legs and wing-pads. The cocoons are found just under the surface of the soil or occasionally at the base of the green stems. Most of the beetles emerge during the latter part of June. The beetle is about one-half inch in length, brownish in color; the prothorax is marked with three pale lines and the wing-covers with small black spots; along the outer edge is a pale yellowish stripe and occasionally one along the middle. During the daytime the beetles remain sluggish under

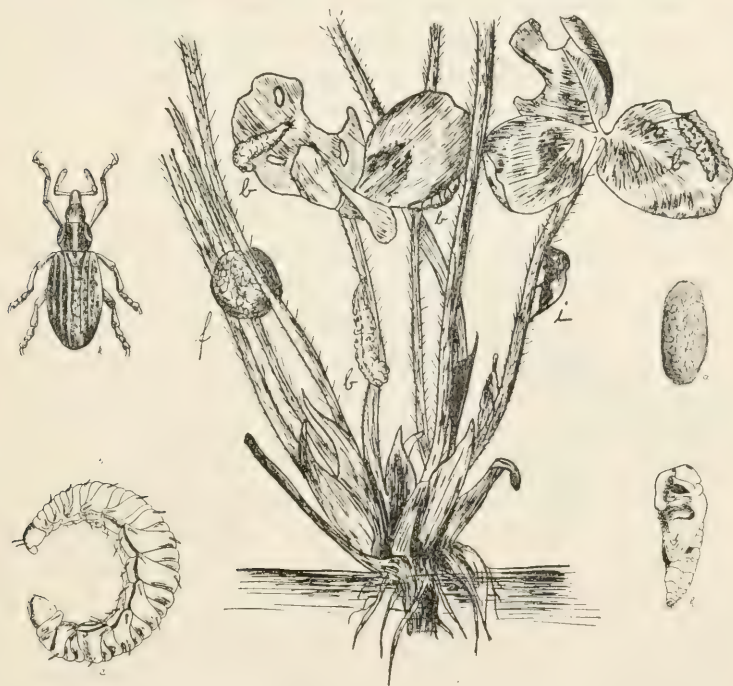


FIG. 660. THE CLOVER LEAF-WEEVIL: (a) EGG; (b) LARVAE FEEDING; (c) RECENTLY HATCHED LARVA; (f) COCOON; (h) PUPA; (i) BEETLE; (k) SAME, DORSAL VIEW. (*Redrawn after Riley*)

débris on the ground. At night they feed on the clover leaves, beginning at the margin and eating toward the middle, usually leaving only the bases of the larger veins, but often, in cases of severe infestation, devouring the whole plant down to the ground. Egg-laying does not begin until the latter part of August and it takes place usually at night. At this time the beetles insert their

elongate oval eggs about one-twenty-fifth inch in length into the clover stems; occasionally they are placed between the stems at the base of the plant. A female is capable of laying forty or more eggs. The eggs hatch in about four weeks and the young grubs spend the winter in rubbish about the base of the plants. Rarely the insect spends the winter in the egg stage and sometimes as a beetle, but these beetles are so weakened by spring that they die without laying eggs. There is but one generation annually.

Control. Fortunately the clover leaf-weevil is in large measure held in check by a parasitic fungus which attacks the young larvae and kills them in great numbers. No practicable method of artificial control has been devised.

THE LESSER CLOVER LEAF-WEEVIL

Sitona flavescens Marsham

The destructive work of the clover leaf-weevil last treated is augmented by a related species of similar habits. This lesser clover leaf-weevil occurs abundantly throughout New York State where it attacks red clover and alsike. It is said to have a special fondness for white clover. The insect passes the winter in the larval state, either in the stems close to the crown or in the roots. Most of the grubs become only partially grown in the fall and complete their growth in the spring. The mature larva is one-fifth inch in length, yellowish white in color; the head is yellowish brown with whitish



FIG. 661. CLOVER LEAVES
SHOWING THE CHARACTER-
ISTIC INJURY OF THE LES-
SER CLOVER LEAF-WEEVIL
(Redrawn after Folsom)

lines. The larvae become full-grown during the latter part of May and transform to delicate, pale yellowish pupae in small earthen cells in the ground near the base of the plant. The beetles emerge in from two to three weeks but do not lay their eggs until September. The adult insect is a small dark brown or rusty brown snout-beetle, slightly over one-fifth inch in length. In feeding, the beetle eats out a semi-circular area either on the edge of the unopened leaflet or on the midrib; when the leaf unfolds the injury appears either as a circular hole

in the center of the leaflet, or as symmetrical notches along the edge. (Fig. 661.) The eggs are about one-sixteenth inch in length, white to blackish in color, and are deposited by the female at the base of the stems or among the roots. The eggs hatch in from two weeks to a month and the young grubs become partly grown before the advent of cold weather. In addition to the injury to the foliage done by the feeding of the beetles the grubs injure the roots and the base of the stems so as often to cause the wilting of the plant.

While the lesser clover leaf-weevil is generally distributed and occurs in considerable abundance, its injuries have never been of such a nature as to call for special remedial measures.

THE CLOVER STEM-BORER

Languria mozardi Latreille

The stems of mammoth and of medium red clover are often hollowed out by a yellowish grub that feeds on the pith. While the presence of this larva does not kill the stem outright, it does weaken the plant to a considerable extent, increasing the tendency to lodge and decreasing the quantity of seed produced.

The parent insect is a beautiful, slender, reddish beetle with dark blue wing-covers from one-sixth to one-third inch in length. The beetles pass the winter hidden away under rubbish. In May and June the females deposit their eggs in the stems of clover plants more than one year old. When preparing to oviposit the female first eats a small hole into the stem, and then forces the egg down into the pith. The egg is about one-fifteenth inch in length, pale yellowish in color, elliptic oval in outline and slightly curved. The eggs hatch in from three to five days and the young grubs burrow through the stem, eating only the pith. The full-grown larva is yellowish in color and about one-third inch in length. Most of the larvae become mature during late July and early August. They pupate in their burrows and the beetles emerge the same season, going into hibernation with the advent of cold weather.

The clover stem-borer is not restricted to clovers, but also attacks many common weeds. It is most abundant in volunteer clover plants growing in neglected fields and along roadsides.

Remedial measures have never been found necessary for this pest since the grubs are destroyed in great numbers wherever clover is cut at the proper time.

THE CLOVER-SEED CHALCID

Brucophagus funebris Howard

The depredations of three insects—the clover-seed chalcid, the clover flower-midge, and the clover-seed caterpillar—render the production of clover seed very uncertain, and consequently

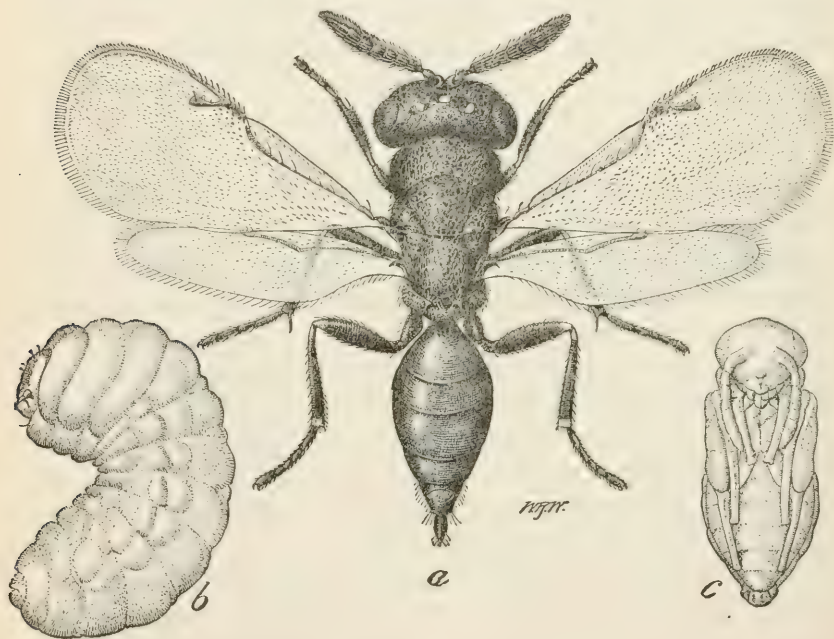


FIG. 662. THE CLOVER-SEED CHALCID: (a) ADULT; (b) LARVA; (c) PUPA.
(U. S. Department of Agriculture)

greatly increase the cost of raising this crop. The first of these is probably, on the whole, the most injurious, although it often happens that the second is more destructive.

The clover-seed chalcid is abundant throughout the state. The adult insect is a small four-winged fly (Fig. 662, a), slightly less than one-twelfth inch in length, black in color with parts of the

legs yellowish brown. At least fifty per cent of the crop is, on the average, annually destroyed by this pest. The clover-seed chalcid is also the most serious pest with which the grower of alfalfa seed has to contend.

On close examination the flies will be found on the clover heads throughout the season. The female is provided with a sharp needle-like ovipositor with which she inserts an egg through the floral envelope directly into the kernel of the unripe seed. This minute egg has a remarkable shape, being broadly ovate and provided with a long slender pedicel or handle about twice as long as the egg. From the egg there hatches a small grub that devours the entire contents of the seed and when mature (Fig. 662, *b*) occupies nearly the whole cavity. Pupation takes place within the seed and the adult fly emerges by gnawing a small, round hole through the seed-coat. Infested seeds have an abnormal appearance, being dull brown, often misshapen, and a little undersized. The insect may reach maturity and the adults emerge from the seeds within three weeks after the eggs are laid, but the period is usually much longer. Emergence is very irregular, depending in large measure on the conditions of temperature and moisture. It has been found that the adults appear in maximum abundance in June and again in August. From eggs laid by the June brood of flies adults will continue to emerge from July throughout the remainder of the season and some will hold over until the following May and June. The greater proportion, however, emerge during August of the same year. From eggs laid in August some adults will emerge the same season, but most of them do not emerge until the following spring and a few may not emerge until the following August.

Control. If the grower intends to harvest a crop of clover seed the first crop should be cut rather early, as soon as the field comes into bloom, so as to prevent the development of a large proportion of the early brood of insects and thus decrease the size of the second brood. If the newly seeded clover has a heavy bloom it would pay either to cut or pasture this off in the fall in order to reduce the number of chalcid flies emerging in the field the following spring.

THE CLOVER FLOWER-MIDGE

Dasyneura leguminicola Lintner

The clover-midge is generally distributed throughout New York, where it is one of the most important causes for the



FIG. 663. THE CLOVER FLOWER-MIDGE,
FEMALE.

(Redrawn after Webster)

failure of the seed crop. It was first discovered in the vicinity of Albany in the late seventies. This pest is usually associated with the clover-seed chalcid and it is often difficult to determine which is responsible for the greater part of the damage.

The parent insect is a minute, delicate, two-winged fly about one-twelfth inch in length. The head and thorax are black and the abdomen reddish. The flies appear in the clover fields when the plants are beginning to head.

The female (Fig. 663) is provided with an extensile ovipositor at the tip of the abdomen by means of which she is enabled to insert her minute yellowish to orange eggs down into the flower-head, where they are glued to the hairs of the calyx tube. The eggs hatch in about three days and the young maggot works its way between the petals of the unopened flower, enters the ovary, and devours its contents. The infested flower-buds remain aborted and the corolla usually does not open. Where a large proportion of the flower buds are infested the head remains green or becomes distorted. The larvae feed during June and emerge from the heads about the first of July. The mature maggots are about one-twentieth inch in length and white to orange in color. On leaving the heads they descend to the ground where most of them spin cocoons within which they pupate. The insect remains in the pupal state for about three weeks. The flies of the second brood are most abundant during the last week of July and the first half of August.

A large proportion of the larvae of the second brood leave the heads and hibernate in the ground, but some of them remain in the clover heads. There are two full generations annually in New York and there is thought to be a partial third brood in some years.

Control. In case the grower desires to harvest a crop of seed the hay crop should be cut rather early, by the middle of June. This will destroy a large proportion of the first brood of the clover blossom-midge and will cause the second crop of clover to mature earlier and thus be past the susceptible stage when the second brood of flies appears during the last of July. Fortunately the early cutting of the hay crop is a good practice for other reasons.

THE CLOVER SEED-CATERPILLAR

Enarmonia interstinctana Clemens

Another serious enemy of clover seed is a small dirty white caterpillar that feeds in the flower-heads, the clover seed-caterpillar. (Fig. 664.) This pest is widely distributed in New York State, is usually abundant and occasionally very destructive. The parent moths appear in our fields during the latter part of May, remaining on the wing for about a month. The moth has an expanse of about one-third inch. The fore wings are brownish in color and each has along its front margin eight oblique silvery white marks. On the posterior margin are two nearly parallel curved marks which, when the wings are closed, form, with those on the other side, two conspicuous silvery crescents. The female deposits her nearly circular, slightly flattened, greenish eggs on the green flower heads. On hatching, the young caterpillar eats its way into the head where it feeds upon the unopened flower buds and the tender green seeds, usually spoiling the whole head. The full-grown

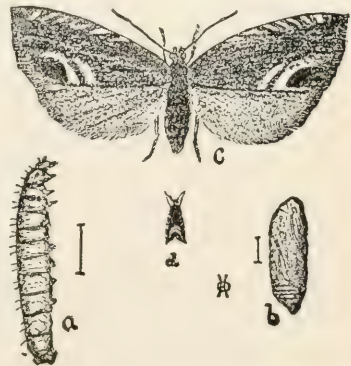


FIG. 664. THE CLOVER SEED-CATERPILLAR. (a) LARVA; (b) PUPA; (c) MOTH (ENLARGED); (d) EGG. NATURAL SIZE.

(After Osborn)

caterpillar is about one-third inch in length, dirty white in color, and is often tinged with greenish or orange. The caterpillar reaches maturity in about a month and transforms into a small brownish pupa within a silken cocoon in its burrow. A second brood of moths fly during the latter part of July and a third brood appears in September. There are therefore three generations annually. The insect usually hibernates in the pupal stage.

Control. The principal injury to the seed crop is caused by the second brood of caterpillars working in the green heads. Since the flight of the second brood of moths occurs at the time when the greatest number of clover-seed midges are on the wing, the same measures will be found effective for the control of both.

VALUE OF CLOVER AS STOCK FEED

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Farmers' Institute Lecturer

THE FUNCTIONS OF FOOD



The value of any one article of food depends to some extent upon what is desired to be accomplished, with what other foods it is to be fed, its digestibility, palatability, and many other conditions.

As all animals need certain elements to maintain life, if growth, production, or labor are performed, additional food will be required to meet these needs. All plants contain all of the elements necessary to maintain life and the added requirements of growth, labor, and production; but the different plants contain these elements in greatly varying amounts. This fact necessarily makes one plant worth much more than some other plants for feeding.

Generally speaking, we may say the plants that contain the elements we desire in largest proportion, and, if fed alone as a roughage, come nearest to being a balanced ration, are most valuable. The cost of production and condition of soil after the crop has been removed should also be taken into consideration, but a treatise on growing clover may be found elsewhere in this bulletin, therefore that phase of the subject will not be considered in this article. (See page 2854.)

VALUE OF CLOVER AS A SOURCE OF PROTEIN OR NITROGEN

It is very fortunate for the farmer that the plants containing the most expensive elements of food in greatest amount also leave most in the roots to rot and enrich the soil. The most expensive element in food, for both plants and animals, is nitrogen. This is found to greater extent in clover than in most other plants, about one-sixth of the protein being nitrogen.

Rations for milch cows — growing or laboring animals — should be combined in about the same manner, and should contain about one part of digestible protein to five or six parts of the digestible materials that furnish heat and energy, with sufficient mineral to meet the needs of the animal.

CLOVER HIGH IN MINERAL MATTER

Many times the mineral in a ration is not considered, but this should be done for several reasons, as follows: the bones are built and maintained largely from mineral matter; if milk is being produced, young developed, or both, additional mineral is required: a full supply of digestible mineral in the food also aids digestion.

The exact amount of mineral required by an animal for any given work has never been determined, but we know that when animals are fed timothy hay, straw, cornstalks, gluten feed, and the like, all of which are deficient in mineral content, they soon show a lack of mineral. Their desire to chew bones and to obtain mineral in other ways, and in some cases premature dropping of their offspring, are indications that their food is deficient in this element. We also know when animals are being fed for any length of time on clover hay, alfalfa, cottonseed meal, oil meal, and other foods rich in ash these conditions do not prevail very long. The wise feeder will therefore see that some of either or both of these grasses or grains that he feeds contain a good supply of mineral.

COMPARATIVE VALUE OF CLOVER

We naturally fix the value of one plant by the value of other plants that can be grown in the same locality and with the same ease. Let us consider the composition and digestibility of a few of the plants most commonly grown on New York farms for roughage.

POUNDS OF DIGESTIBLE MATERIAL IN 1,000 POUNDS

	Ash	Protein	Total	Ratio
Clover hay	66	71	510	1-5.9
Timothy hay	44	28	481	1-16.2
Oat straw	51	13	426	1-31.8
Cornstalks	12	14	342	1-23.4

From the above table it will be seen that clover hay carries considerably more ash, from more than double to over five times as much digestible protein, and a greater amount of total digestible nutrients. The protein being the most expensive element, it makes clover hay considerably more valuable than any of the other foods mentioned. Clover hay cut at the proper time, which is during full bloom, is eaten by stock with a good relish; this adds to its digestibility.

At a price for the digestible nutrients in clover hay based on the cost of these elements in concentrated feeds, it is worth \$17.82 a ton. At the same price for the nutrients in good oat straw, the straw is worth \$9 a ton. This does not mean that the prices mentioned would be relatively correct if both were fed alone. It might be true with clover hay, which is practically a balanced ration of itself; but oat straw is so low in elements required to feed and nourish the muscles and nerves that an animal would starve to death in time if fed on it alone. If we mix one ton of good oat straw with one ton of clover hay, the mixture will be quite equal in feeding value to two tons of meadow hay, and in that case the straw would be worth \$9 a ton.

In any way we turn the question of the value of clover as a food, its great superiority over any plant that is so generally grown in New York state is apparent. As a food for horses it has not been considered very safe, except when fed in small amounts; however, for cows, sheep, hogs, and all growing animals it has no equal except alfalfa and some other legumes, which are and probably ever will be grown here only in limited quantities.

The nutritive ratio of clover is about right for milk production. As it contains a high percentage of mineral, animals fed on it, either as pasture or hay, will develop strong bones. Every part of the body will also be well nourished and satisfactory results will follow.

CAUSES OF CLOVER FAILURE

EDWARD VAN ALSTYNE, Kinderhook, N. Y.

Director of Farmers' Institutes

If clover were a plant that had not been previously grown in New York State, the verdict of farmers based on the results of a series of years prior to 1915 would probably be that clover is not adapted to our soil. Based on the evidence of 1915 and up to the fall of 1916, an entirely different verdict would be rendered, to the effect that clover would grow almost anywhere. Neither opinion would be a just one, and the latter may need revision before the harvest of 1917. The reason for the successes now so much in evidence is chiefly an abundance of moisture; given this, and even "the desert will blossom as the rose." In addition there was a winter blanket of snow, with very little frost beneath, which continued nearly or quite until April 1, and consequently no alternate freezing and thawing, so fatal to the finest stands in the fall.

The wise man in any line of endeavor is not he who looks chiefly for the successes, but he who seeks out reasons for possible failure. With these understood and overcome or prevented, success is insured. Therefore, my purpose is to point out causes of failure, that suitable measures may be taken to prevent their recurrence. In this connection I wish to emphasize two or three fundamental facts.

First, I would reiterate the oft-repeated statement that he who can grow a crop of clover, no matter what his line of farming, is well on his way to success as a farmer. Therefore, every effort put forth to secure a stand is in the line of good farming.

Secondly, it is unwise and uneconomical to sow expensive clover seed on land too poor to grow a decent crop of rye — preeminently the poor-land crop — or on land otherwise unsuited for any one or more of the reasons given below. Were the money available that has been spent for clover seed and waster because it was sown where the chances were all against it, it would be enough to pay

for necessary drainage and sufficient lime to have overcome these too frequent handicaps, not to speak of manure and fertilizer. This caution is very important at this time when clover has grown so luxuriantly that many will be inclined to sow it with a lavish hand, forgetting past failures and that the favorable conditions existing for the past two seasons are unlikely to be repeated immediately.

A young man of my acquaintance purchased a run-down farm of naturally light land, devoid of vegetable matter. He was handicapped for lack of funds, but for three years in succession he spent \$60 annually for clover seed, and during that entire period he harvested four loads of what might be termed clover hay. When I advised him not to sow clover, he expressed surprise. After I had pointed out what that \$180 might have done for him in other lines and the almost certainty that like failure would result from a similar expenditure unless humus were restored, he saw my point and has since been giving attention to other more certain and less expensive methods of soil improvement.

After this rather lengthy but necessary introduction, I will take up in order of their importance some causes of failure with very brief suggestions as to remedy.

LACK OF MOISTURE

That abundant rainfall has been chiefly responsible for the growth of clover referred to warrants my placing lack of moisture first. Note, I do not say rainfall, but moisture, for we can in no possible way control the *falling* water, in either the early or later rain, but we can control the *fallen* water to a much greater extent than we do — by surface tillage, thus preventing evaporation; by vegetable matter in the soil; and by drainage, all of which will receive notice under different heads and are emphasized in other parts of this bulletin.

A brief summary of the functions of water emphasizes its vital importance. There will be required 4,100 pounds of water to produce the dry matter in a ton of clover hay. Moisture is necessary to make plant food soluble, either applied food or that latent in the soil. I heard an eminent chemist questioned as to why phosphoric acid gave no returns on a certain area of land. He

inquired what was the average yield of grain and on being told asked, "And you get no increase when you apply sufficient phosphoric acid to grow from three to five bushels more?" Being again answered in the negative, he said: "Evidently you have sufficient phosphoric acid and enough water to grow the first-named amount. It is as necessary to increase the water to obtain an increased yield as it is the plant food." The illustration is illuminative. Again, moisture is necessary for the development of soil bacteria.

POOR DRAINAGE

At first glance this might seem like a contradiction. There is a great difference between a soil saturated with water and one with a film of water surrounding the soil particles. The former is waterlogged; air and heat — both vital to plant growth and soil activities — are shut out; it becomes sour. Plants are shallow-rooted on such soil, and are therefore easily thrown out by the spring frost. When the surface becomes dry later in the season, they wither and die. Such land remains cold a long time, and nitrification cannot take place. It is a well-established fact that a well-drained soil is not only dryer in a wet time, but that it contains more moisture in a dry one. Many a dollar spent for clover seed is almost certain to be lost when the seed is sown on undrained, water-saturated soil, while money laid out for drains would return manifold and certain returns for years to come.

ACIDITY OF SOIL

It matters not how fertile is the soil and how full of necessary bacteria — if it is acid, clover will not grow. It took me thirty years to learn this lesson, and the loss of many dollars through clover failure — and this on rich, well-drained land, because it was acid. Lime solved the problem; in this case half a ton of caustic lime or one ton of ground limestone was sufficient. Two years' experiments on other fields of a different character indicate that twice this amount is necessary for a satisfactory growth of clover. A tester costing about \$5, known as "Dr. Truog's soil acidity tester", made by the Central Scientific Company, 420 Orleans St., Chicago, will very accurately determine the amount of lime needed. Many of the farm bureau managers have this tester; all should have it.

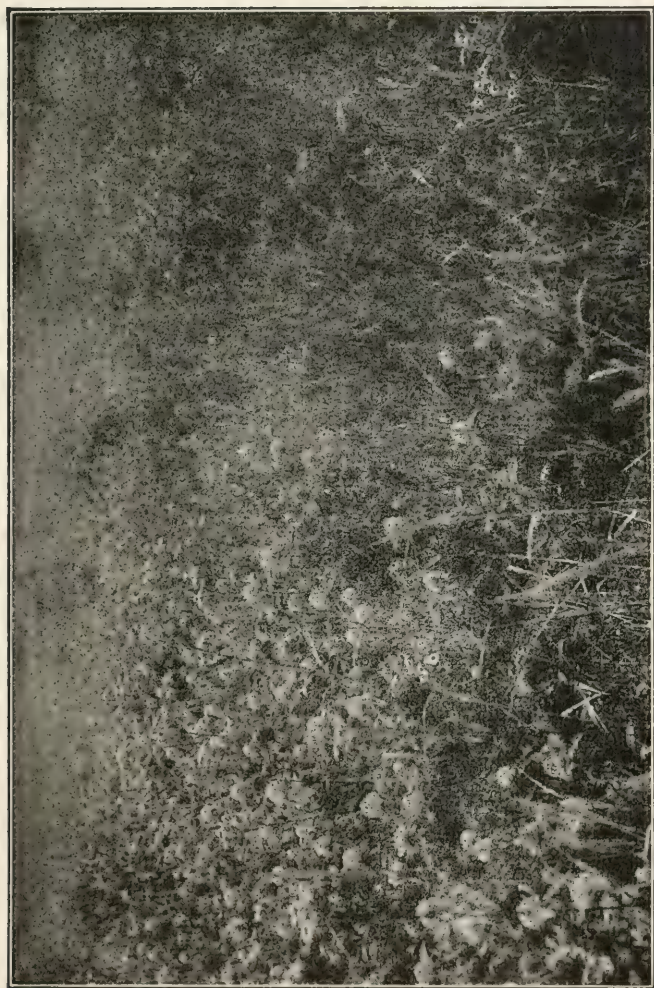


FIG. 665.—RED CLOVER ON LIMED AND UNLIMED LAND

Lime is a necessary plant food for clover. Each ton of clover hay contains from 45 to 65 pounds of lime. In many soils there is not enough available lime to supply this need, and the crop suffers both in quality and quantity.

It may not be out of place, after emphasizing the importance of lime in clover production, to say emphatically that it will not furnish moisture, provide other kinds of plant food, drain the land, nor fit the soil.

LACK OF AVAILABLE PLANT FOOD

Clover turned under, or clover sod, will increase the nitrogen and the vegetable matter in the soil, but it will return only what mineral matter it took from the soil, hence the necessity of adding potash and phosphoric acid. While clover will help build up soil, it is useless to sow it on land too poor to grow less-exacting crops; yet how often we hear or read the advice given in answer to the question, "How shall I restore my poor soil?" "Sow clover and plow it under." To sow it is easy — but expensive. On such land, however, there will be little opportunity to plow it under.

No applied fertilizer is so certain to give returns in growing clover as manure. It not only contains plant food, but supplies humus-making material of the very best sort. It acts as a mulch and is an important and often necessary medium for the spread of clover bacteria. I know of no place where manure will bring greater and more lasting returns than when applied to clover, either at time of seeding or in late summer or fall. Six or seven tons per acre applied with a spreader has more than once made the difference between a large and a poor crop. After the former, the land was naturally better for the clover crop.

Next to manure, potash usually pays best on clover. The present high price for this commodity is prohibitive. Wood ashes are a good source of this element and contain a small amount of phosphoric acid and considerable lime. One can usually purchase the last two in other forms at less cost. Much of the so-called "wood ash" of commerce contains very little potash or anything else of value. Such should always be purchased under a guaranteed analysis of potash and other plant foods contained. Real ash will show an average analysis of about 5 or 6 per cent potash and 1½

per cent phosphoric acid, although I have purchased that which ran as high as 8 per cent potash. A half-ton of 5 per cent ash applied to an acre would contain only 50 pounds of potash, or as much as is contained in 100 pounds of muriate.

Phosphoric acid is also a very necessary factor. Usually this can be most economically supplied in acid phosphate, in which form it is quickly available—most important for the young clover.

While clover is a nitrogen gatherer, it cannot do this until it has attained size and considerable leaf growth. For this reason nitrogenous manures show good effects, as has been stated. If there is an abundance of nitrogen in the soil, the evidence is that the plant will take little from the air; therefore, it is unwise to give the clover an excess of this element when it is well grown. Nevertheless, it is absolutely necessary for its best growth that it should have enough to give it a start. I have used from 75 to 100 pounds of nitrate of soda per acre with marked results. Being quickly soluble in cold weather, this is the most economical form in which to buy nitrogen.

VEGETABLE MATTER

This is closely allied to the question of fertility, for the amount of nitrogen in any soil is always commensurate with the quantity of vegetable matter it contains.

Decaying vegetable matter produces an acid that liberates locked-up mineral matter in the soil, of which we are told there is an abundant supply. It also acts as a sponge to retain moisture. As I am writing, there has been a period of about two weeks without rain. A field of corn just west of the highway is curling for lack of moisture, the soil being deficient in vegetable matter. In two fields across the road belonging to different men there is corn with a much more abundant growth, making a greater demand for moisture, but there is not a sign of curl. There, the soil is full of humus.

Again, vegetable matter, like manure, is a necessary breeding place for soil bacteria. There are usually clover bacteria in land where clover has been previously grown; but, unless there is decaying vegetable matter present in fair amount, these cannot

multiply. In this connection I would say that usually it is not necessary to sow the bacteria of red clover. It is true, however, that occasionally good results are obtained by inoculation, as with alfalfa. A soil may be so acid as to have destroyed all bacteria; or so long a period may have elapsed since clover was grown on the land, or manure from clover-fed stock applied, that the bacteria are no longer present. When other conditions seem right and clover still fails, I should recommend an application of bacteria, either in soil from an old clover field or in a prepared culture applied to the seed. It will, however, be of no use to sow bacteria unless there is moisture enough and soil conditions are such as to keep it alive and allow it to multiply.

POORLY PREPARED LAND

While it is true that for the past two years we have seen clover grow on the poor earth along the highway and other like places, we must keep in mind that only an abundance of water has made this possible. Many a crop failure is due to soil so poorly fitted that the tiny plant roots cannot penetrate, even when there is enough soil to cover them. A clod of earth may be ever so full of plant food, lime, and bacteria, but, so long as it remains a clod, no film water can surround anything except the outside particles. As no roots can penetrate it, all the good it contains will be of little worth to the clover. A well-fitted fine soil holds much more moisture, and plant roots easily and deeply penetrate it and get hold of plant food.

Unquestionably, much seed dies because it is poorly covered. This is particularly true when clover is sown in spring on winter grain. It sprouts quickly when near the surface, sometimes to be injured by late frosts, or, escaping this, dies from drought or heat after the protecting grain has been removed. I have found no better time to sow on winter grain than in the spring on a morning when the ground was honeycombed with frost, the seed then working into the cracks to a sufficient depth to insure protection and, later, deeper rooting. Following with a roller after the ground is dry enough to bear it will materially assist. There are now on the market seeders with small disks which are to be recommended for sowing clover seed on grain land.

OTHER PLANTS ON THE LAND

I might have named this cause of failure "weeds," but that would not have expressed my thought. Ruskin said, "Dirt is something in the wrong place." The same is true of a weed. What we call such often have great value as medicinal herbs. A clover plant in a strawberry bed is a most pernicious weed.

It is apparent to anyone that a crop of clover cannot be expected on soil occupied by weeds. To avoid this is an added reason for good tillage. It is not so apparent that a grain plant may and often does have the same ill effect on clover as does a weed. I have seen timothy so thickly sown in the fall that it monopolized the land to such an extent that the clover had little chance, except in a strip across the field where the timothy had run out of the drill. There, with undisputed possession, the clover was all that could be desired. I have usually had a good clover seeding with oats and peas cut green, but not generally a good stand on the same field where the crop stood until the grain was mature.

It is usually advisable to sow the grain crop more thinly or to cut before maturity — when it has made much less heavy drafts on the soil, both of fertility and moisture — where clover is the important thing. In some instances, it is desirable to sow clover alone.

POOR SEED

This, though last, is by no means least, for more than one failure has been due to this cause, when everything else has been right.

I have known farmers to drive five miles to save 25 cents on a bushel of clover seed, when the cheaper seed was dear at any price, either because it had poor germinating powers or because it was foul with weed seeds. We have a new and exceedingly troublesome weed in my neighborhood introduced in a lot of clover seed that was supposed to be cheap. One dollar on a bushel of seed is only 25 cents an acre, if one sows a peck — a trifling matter in any event — but it is very expensive when one loses his seeding or buys weed seed at 10 or 12 cents a pound. When seed is very high, and one must economize, better buy the best seed and sow a less amount to the acre.

There was a time when one might have an excuse for sowing foul seed; that no longer exists. The poorest farmer in the state

can secure a sample of the seed he thinks of buying and send it to the Experiment Station at Geneva and have it tested without expense other than postage. Many of our best dealers are doing this and furnishing their customers with the Geneva test. The Experiment Station will not test seed for germination. That a farmer can do for himself. With this I fully sympathize; it is poor policy for the state or Government to do for a man what is within his own power of accomplishment, for to do this develops a class of weaklings. Seed sown in a pan of earth behind the kitchen stove will give a pretty fair idea of its germinating power, if one does not care to take the more elaborate plan of a test box.

INSECTS AND DISEASE

These are often serious obstacles in clover growing and not so much within the control of the farmer as are the other causes of failure cited. Were it not for some things beyond our control, "we should be as gods knowing good and evil," and success would be so assured that it would not be worth attaining. Matter relating to these difficulties will be found on pages 2898-2903.

CONCLUSIONS

If one will study his conditions and take means to overcome the causes of failure, clover will be as certain as any crop on the farm — much easier to write about than to do, I know, but only those things that require effort are worth the doing.

It is much easier, as well as more economical, to learn underlying principles and then strive to work in harmony with them than to charge failure to bad luck, change of seasons, or failure to do the work in the right phase of the moon or the sight sign of the zodiac.

ALFALFA, THE ENCHANTED HERB

F. D. COBURN, Topeka, Kan.

Author of *Alfalfa, Swine Husbandry, The Book of Alfalfa, and Swine in America*, and for more than twenty years secretary of the Kansas Department of Agriculture.

HISTORY



A peculiar circumstance in relation to American agriculture is that the perennial clover we call alfalfa — the *Medicago sativa* of botanists, the lucerne of Europe, and the most productive and profitable forage plant known, a reliance in the old countries since man's beginning, which prospers nearly everywhere — should be so relatively new to most of this country, to which it seems so especially adapted, and in fact to a majority be as yet quite

unknown. We are told that it flourished and was of great importance to the husbandry of Persia, Arabia, Babylonia, Greece, Rome, Spain, Italy, and Switzerland.

Known in later centuries as Spanish clover, and in parts of the world as lucerne, it reached Western South America from Spain, coming thence as Chilean clover northward to Mexico, and to California perhaps sixty-odd years ago; then, gradually working eastward, it attracted attention in the Middle West within but a very recent time. It was but little more than two decades ago that Kansas City, now probably the foremost hay market in the world, saw its first car of alfalfa hay. Last year 12,131 carloads were received, and it is distributed from there to every state and every considerable community east of the Missouri River.

However, the colonists, beginning more than two centuries ago, made repeated attempts to establish alfalfa in the eastern part of the United States, but usually with indifferent success. It seems eventually to have secured a permanent hold in the limestone

lands of north-central New York — for example in Onondaga county, where, becoming understood, appreciated, and fed in dairying, it has long been, as it is now so conspicuously in the Middle West, the handmaiden of substantial prosperity.

DEFIES DROUGHT; ENRICHES THE SOIL

Defying drought, it grows in portions of the semiarid West with an annual rainfall as scant as 14 inches; while in the Gulf states it flourishes with 65 inches. It gives crops at an elevation of 8,000 feet; and in the sandy bed of the former Salton Sea of southern California, 60 feet below sea level, it grows, with irrigation, to a height of six feet or more, sometimes admitting of nine cuttings a year, aggregating ten to twelve tons. Similar results — exceptional, of course — have been attained without irrigation in the Central West. New York has long grown it in clay and gravel; Nebraska grows it in her western sand hills, without plowing, as does Nevada on her sagebrush deserts. The depleted cotton soils of the South and the rich corn lands of Kansas, Missouri, and Illinois respond with profitable yields. The nitrogen it gathers, with the subsoiling it effects, make even the best lands better, while it restores to exhausted soils the priceless elements of which they have been despoiled by a shiftless husbandry.

The unique characteristic of this plant as a fertilizer is that it gathers nitrogen from the air. It collects and stores many times as much as the parent crop can use, the surplus being deposited in little nodules on the roots, where it is available to whatever crops may follow. Alfalfa roots by their incredible length reach where no others go; and, assimilating the mineral elements of the lower subsoils, bring them to the surface transmuted into merchantable commodities. They delve their way downward in every direction, and in the natural processes of decay a part of them are all the time dying. When plowing an alfalfa field, we find the subsoil filled with their decomposing elements, leaving humus far below where it is pushed by any other means, while all the soil is honeycombed to unusual depths with these vegetable pipe lines, through which the rains filter and carry additional fertilization from the surface. They constitute the perfect deep-tilling

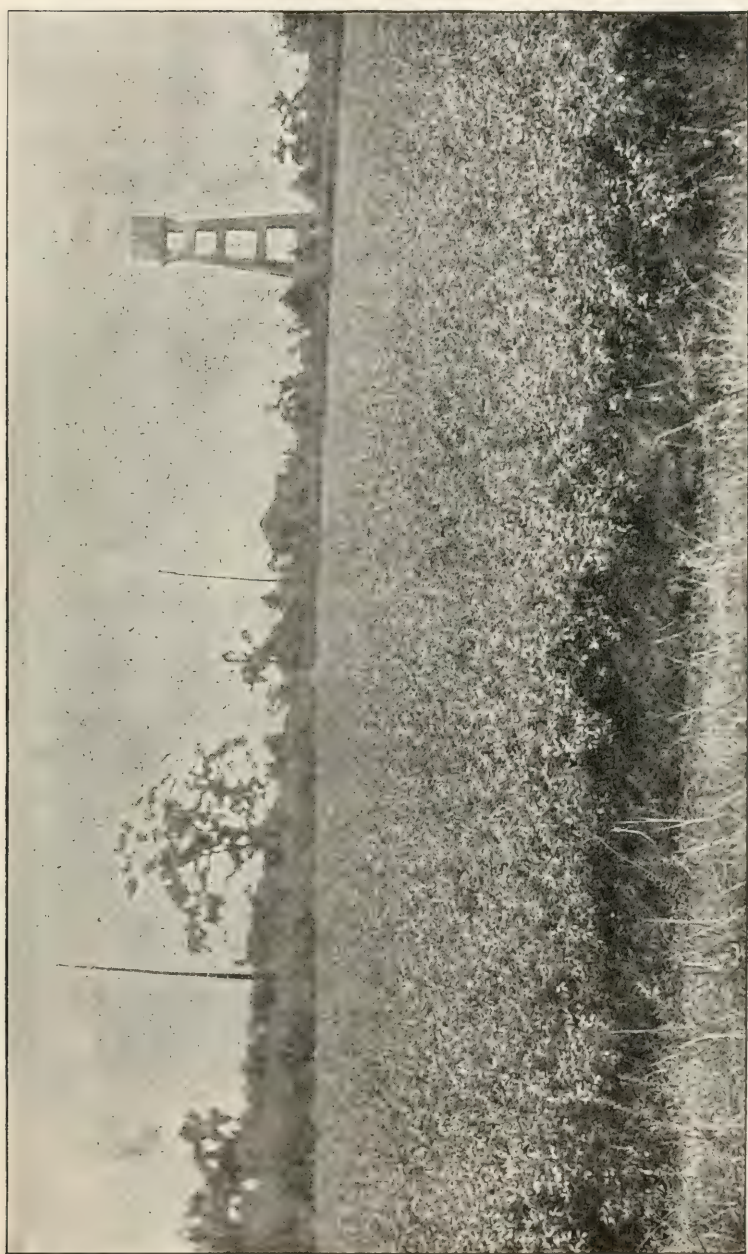


FIG. 606.—FIELD OF ALFALFA ON LONG ISLAND RAILROAD DEMONSTRATION FARM, MEDFORD, L. I.

machine. Headden, of the Colorado Experiment Station, estimates the value of the stubble plowed under, with perhaps 6½ inches of roots, at about \$20 per acre, and of the stubble and entire root system as not less than \$35 per acre.

ALFALFA HAS REVOLUTIONIZED WESTERN AGRICULTURE

Kansas leads in alfalfa, with about 1,400,000 acres, and Nebraska is a close second. Colorado and California, roughly speaking, each have half as much ; Idaho and Utah, one-third; and Montana and Oklahoma, one-fourth as much.

From its advent into Kansas and Nebraska little more than 25 years ago, alfalfa has done more to project these states into the center of the map and has sold more land at higher prices than any other one growth, commodity, or influence. Raw lands, supposedly unproductive, with almost no buyers before, and considered a burden at a \$5 valuation, have been quick sales at \$40, \$75, and sometimes \$100 per acre when seeded to this wonderful forage; others, although not by any means the best, have year after year paid their owners 10 to 40 per cent on valuations of \$200 or more per acre. Since its coming, the tame hay output of Kansas has increased in value from \$2,800,000 to \$34,607,185.

Suggestive of its yields in hay and seed, a Garfield County, Oklahoma, man harvested in a season, from 10 acres of three-year-old unirrigated alfalfa, nine cuttings estimated as averaging 11½ tons each; the previous year the same land yielded seven cuttings, besides in each year an aftermath of eight to twelve inches. A Kansas farmer near Topeka threshed 85 bushels of seed from 10 acres, which he sold for \$935. From 8 acres, an Allen County farmer threshed 99 bushels of seed, which he sold for \$990.

However, such a yield of hay under any conditions is most extraordinary, and more than double what should be expected as an average. Climatic conditions are seldom favorable to producing profitable crops of seed east of the Missouri River.

THE CHEAPEST SOURCE OF PROTEIN

For animals that are growing or giving milk, the element most desired is protein — the one that makes bone and muscle and milk and blood rather than fat. The Wisconsin Experiment Station has demonstrated that an acre of alfalfa will yield three times as much protein as an acre of clover and nine times as much as an acre of timothy. In protein content, good alfalfa hay does not differ widely from wheat bran. With corn, it makes a practically perfect balanced ration.

Government reports say that, based on as many as 21 to 68 analyses, the percentage of protein in timothy hay is 5.9; in clover, 12.3; in wheat bran, 12.2; in alfalfa, 14.3. Figured on their digestible nutrients, if a ton of timothy hay is worth \$9.80, a ton of clover would be valued at \$14.12, and of alfalfa at \$20.16, or somewhat more than twice the value of timothy. The percentage of digestibility of the protein in timothy has been found to be 48; clover, 55; alfalfa, 73.



FIG. 667.—ALFALFA ON FARM OF WESLEY STEWART, NEAR NEWBURGH, ORANGE COUNTY, N. Y.

ESSENTIALS TO SUCCESS IN GROWING THE CROP

In the hands of a novice, after one or two unsuccessful attempts to raise it, alfalfa has not, as a rule, had a fair trial. The fact of a man's having tried it in a given locality once or twice without success, may signify little as to its adaptability. Failure may

come from various causes, and be the result of innocent ignorance or of general inefficiency, for which the locality, soil, or climate are in no way responsible. It might come, for example, from sowing seed, adulterated or otherwise impure; from seed reasonably pure, but in some way damaged so that it was not germinable; from sowing too much or too little; from sowing at the wrong season of the year or at an unpropitious time, when weather conditions were unkind; from improper sowing on exhausted or naturally thin land; from sowing on land improperly prepared, poorly drained, unfortunately situated, or foul with weed seed; from sowing on land so situated as to be too wet, or on old land robbed of its fertility and humus by long-continued cropping.

Among its fundamental requirements are a fairly fertile soil, naturally or otherwise well drained, free from weed seeds, in good tilth — deeply tilled, but compacted afterward rather than loose and ashy — with a surface painstakingly fined, leveled, and smoothed. However, it should not be sowed in freshly plowed ground. The cleaner the ground the more plant food there is available to the alfalfa, and the thriftier its growth. Other conditions being right, there must be in the soil certain bacteria, and if not already present they must be supplied. This is easily done by drilling or broadcasting and promptly harrowing into the freshly plowed ground, without exposure to the sun, 200 to 500 pounds per acre of surface soil from a well-established alfalfa field, or soil in which white sweet clover flourishes. Bacteria from other clovers are valueless for alfalfa. The expense of inoculation is so small that no one can afford to court failure by leaving it undone. Also, if a soil is sour it must be made sweet with lime. All the best alfalfa soils are strong in this; the plant thrives upon and is a glutton for lime. A very large percentage of failures is due to a lack of lime, proper bacteria, or both. They are both necessities and belong together. A ton of caustic lime or two tons of ground limestone per acre, well worked into the surface, is usually sufficient.

In the Middle West, where alfalfa is most largely grown, tendencies are toward late summer or early fall sowing, say about

September 1, and without a nurse crop, but no one rule is applicable everywhere. Some sow in the spring and succeed; others sow with a nurse crop and have abundant success. Needing the sun and being very delicate at first, it seems reasonable that the less shade and fewer competing growths young alfalfa must contend with, the better its prospects are likely to be. In any scheme of general farming the most rational dealing with an alfalfa field is to plow it up when three, four, or five years old and for a time use it (to their great advantage) in other crops, having in the meantime provided for an equal or larger sowing on another part of the farm. This system is ideal for maintaining the farm's fertility and giving renewed vigor to its soil, but in practice its defect is found to be that those having well-set alfalfa fields lack the courage to plow them up for any purpose, and thus an important factor in a most invaluable rotation is left unused.

Abundant stable or barnyard manure applied to alfalfa land is almost a necessity, and there is no record of an alfalfa field being over-manured.

CHARACTER AND QUANTITY OF SEED

There is no such thing as "cheap" seed. Poor seed can alone nullify all the sower's plans and preparations, however perfect. Seed from about the same latitude as that in which it is to be sown will be found most reliable, and that grown without irrigation is best for land not to be irrigated. There is no especially superior variety, however high-sounding or foreign the name. To the general public, alfalfa seed means simply seed of the common alfalfa we all know, and varying or multiplying names or prices in catalogues and advertisements does not change or improve the character of the product.

The Ohio station, from observations on about three hundred farms, concludes that fifteen pounds per acre is sufficient, and says sowing broadcast by hand or with portable seeders is most common, one half the seed being sown at right angles to the other half. A drill made especially for sowing alfalfa, with spouts four inches apart, finds much favor. From a half-inch to an inch of fine, firmed soil is the ideal covering.

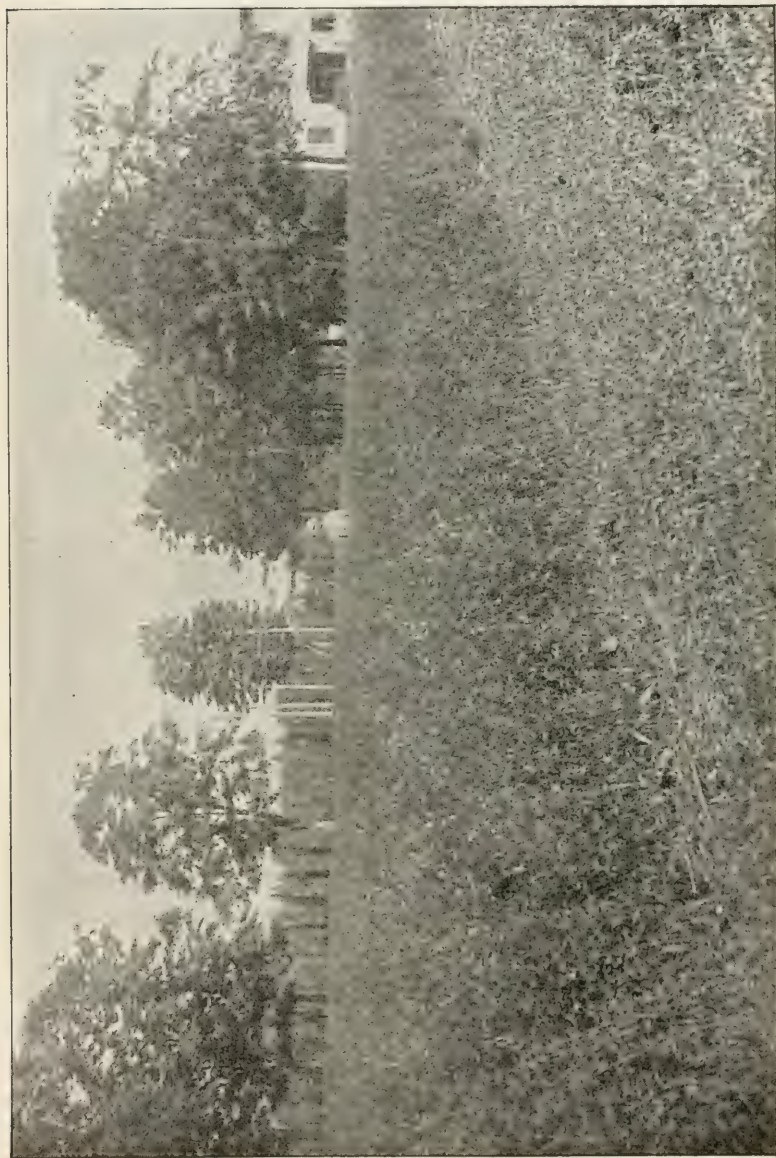


FIG. 668.—SECOND GROWTH OF ALFALFA ON FARM OF A. G. WELLER, TOWN OF STOCKBRIDGE, MADISON COUNTY, N. Y.

TIME AND MANNER OF HARVESTING

Alfalfa should be mown when new shoots at the root-crowns are fairly starting. Harvested thus early, a higher feeding value is obtained, and by promptly taking off the crop as soon as ready there is no check to the subsequent growth. If left uncut until in full bloom, the oncoming shoots are in danger of being mowed off, thereby arresting their progress and delaying maturity, which may mean one less cutting in the season. Also, there is greater loss of leaves when the plants are left too long uncut. Cut quite early in its blossoming stage, the hay cures with more of the much-coveted pea-green color than if harvested later, but some chemical analyses appear to find in the plant that is allowed more time for development upwards of one per cent more protein and a slight increase of fat. Whether this greater percentage in the more mature plant is equally well utilized in digestion is undetermined.

It is always important to rake before the leaves become dry and crumbly. It is through the leaves that the sap is evaporated in curing; if too quickly dried by a scorching sun, this natural evaporation is so interfered with that a poor grade of hay will result. Forking up the windrows into rather high, narrow cocks, possibly the same day the hay is cut, is found excellent. Cocked like this, moderate rain the following night might do it little harm, as the partly cured hay cocked will shed water quite well. With good weather the next day the cocks can be opened out after the dew is off, perhaps turned over, and in the afternoon may be fit for stacking. In favorable weather it can, of course, be left in the cock longer, but as a general thing it is wise to hurry the hay into storage. Once dried and then wet, it is damaged much more than if rained on while yet green. By washing or leaching it loses much sugar, dextrin, and other soluble matter, and also develops fungi. The difficulties of saving alfalfa hay cut in times of humid weather are much the same as with red clover, and but little, if any, greater.

Wetting at any time after the hay is partly cured delays the final curing, causes discoloration and mold, lessens the aroma somewhat, and greatly lowers the selling value, although apparently not decreasing the actual feeding value to anything like the same extent. On the other hand, too much hot sunshine

means loss of leaves, palatability, and weight. Essentials of good haymaking are: cut early; handle no more than necessary; and cure chiefly in the windrow, cock, and haymow or stack.

The importance of proper protection from the weather and of prompt barn storage is indicated by findings of the Colorado station, which were: Alfalfa hay exposed for 15 days after cutting and rained on twice, lost 26.1 per cent of its feeding value; left out for seven days and having only one light rain, it



FIG. 669.—A THIRTY-TON STACK OF ALFALFA GROWN IN NEW YORK STATE.

lost 10 per cent; left out three days without rain, the loss was 5 per cent; also, that, even in Colorado's dry climate, the loss in feeding value from the hour of cocking to the hour of taking from the stack was upwards of 12 per cent, while the loss in hay taken from the barn was but $2\frac{1}{2}$ per cent.

PASTURING

As pasturage for all kinds of live stock, except such as chew the cud (cattle and sheep), alfalfa is unexcelled. In many

instances (as with red clover) but by no means always, the likelihood of its causing fatal bloat, especially when wet or of very rank growth, prevents its being a trustworthy pasture plant for cattle or sheep. It should not be grazed upon at all until well established, and then not severely. If not stocked so heavily as to prevent one or two cuttings of hay during the grazing season, the fresh growths following the mowings will afford conditions well-nigh perfect.

Improper management often kills out stands of alfalfa. This applies to too close or too late cutting in the fall, and to overpasturing, especially during the winter and early spring months. In the northern states, leaving the last of a season's growth uncut to the height of eight or ten inches for protection of the plants against the severity of winter is almost a necessity.

With all its virtues, alfalfa is not a commodity to be grown for sale, but for consumption by live stock on the farm that produces both. Those who use a right intelligence in its raising and conversion into meat, milk, and manure can scarcely evade prosperity, while they will be builders of a constructive and conserving husbandry.

DISEASES OF ALFALFA AND CLOVER

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LEAF SPOT

(See introductory paragraph under diseases of timothy, page 2757.)

Leaf spot, *Pseudopeziza medicaginis* (Lib.) Sacc., is always found on alfalfa and clover leaves, and sometimes on the stem. It is particularly severe during rather dry seasons.



FIG. 670.—THE LEAF SPOT ON ALFALFA.

On alfalfa there are produced small yellow spots, which, if abundant, will cause dropping of the leaves. The new leaves may become infected as they develop and each new period of infection results in new spots on all leaves. Hence the older, lower leaves are most severely diseased and are first to drop. The abundant upper foliage will mask the diseased condition of the lower leaves unless the trouble is particularly severe.

On clover, the spots are large and brown. It may cause drying and withering of the leaves and petioles, but the leaves do not fall from the plant as in alfalfa. The disease is not so serious on clover.

There is no practicable control method. The only thing to be done is to cut the crop before the disease becomes too severe and thus save as many of the leaves as possible.

DODDER

The dodders, *Cuscuta* sp., are parasitic flowering plants which attack a great number of hosts. In clover and alfalfa fields, dodder may become very destructive, killing in ever-widening circles. In the center of the infested areas the host plants will be entirely killed, while about the margin of these dead areas will be seen the dense mat of orange or yellowish stems.

The parasite consists of slender, yellowish or orange-colored, much-branched stems, on which are borne at rather frequent intervals clusters of white flowers. There are no leaves nor roots produced. The parasite is entirely dependent upon its host for food. It twines about and over the clover or alfalfa, producing a great



FIG. 671.—THE LEAF SPOT ON CLOVER. COMPARE THIS WITH FIGURE 8.

mat of stems. In order to get its food, the *Cuscuta* produces lateral, root-like organs, called haustoria, which penetrate into the stems and leaves of the host, thus diverting the flow of host sap into itself. In this way the host is slowly killed, but in the meantime the dodder has grown out to new hosts.

It seems rather doubtful if the alfalfa dodder produces seed in this state, but it has another equally efficient means of overwintering. As the stems twine about the alfalfa crowns close to the ground, they escape cutting, and are able to persist throughout the winter in a dormant vegetative condition.

The control of this disease may be protection or eradication. If alfalfa is to be planted, a sample of the seed to be used should be sent to the Geneva Experiment Station to be tested for impurities; and, if dodder is reported, the seed should be thoroughly sifted in the following manner:

The frame of the sieve to be used should be 12 inches square by 3 inches deep. The screening must be of 20 x 20-mesh wire cloth made with No. 34 steel wire or No. 33 copper wire (Old English gauge). This can be obtained from Dorchester and Rose, Geneva, N. Y. Next, secure a cup that will hold not more than one-half pound of seed. Pour a quarter to one-half pound of seed into the sieve and shake thoroughly for 30 seconds. In this way all the dodder seed, a small amount of small alfalfa seed, and many of the weed seeds will be removed. The loss of the small alfalfa seed is not serious, because the plants produced would probably not be vigorous. A man should be able to sift three to seven bushels a day.

Dodder and clover seed are almost impossible to separate, and contaminated clover seed should be refused.

If dodder is present in the field, it may be killed by cutting the clover or alfalfa close to the ground for at least a yard about the dead area. Do not remove the plants, but pile in the dead area. After the plants are dry, put more straw on the area, sprinkle with oil, and burn over thoroughly. The object of the oil is to draw the fire down to the ground and kill all the dodder stems which may have not been cut.

DOWNY MILDEW

Downy mildew fungus, *Peronospora trifoliorum* De By, causes a yellowing of the affected leaves, accompanied always with a downy, violaceous growth on the lower surface of the diseased areas. The disease is not especially serious, except on the first growth. No control measures are known and are probably unnecessary.



FIG. 672.—THE EARLY STAGES IN THE DEVELOPMENT OF THE LEAF SPOT ON ALFALFA. NOTE THAT THE LOWER LEAVES ARE MOST SERIOUSLY AFFECTED AND ARE BEING KILLED.

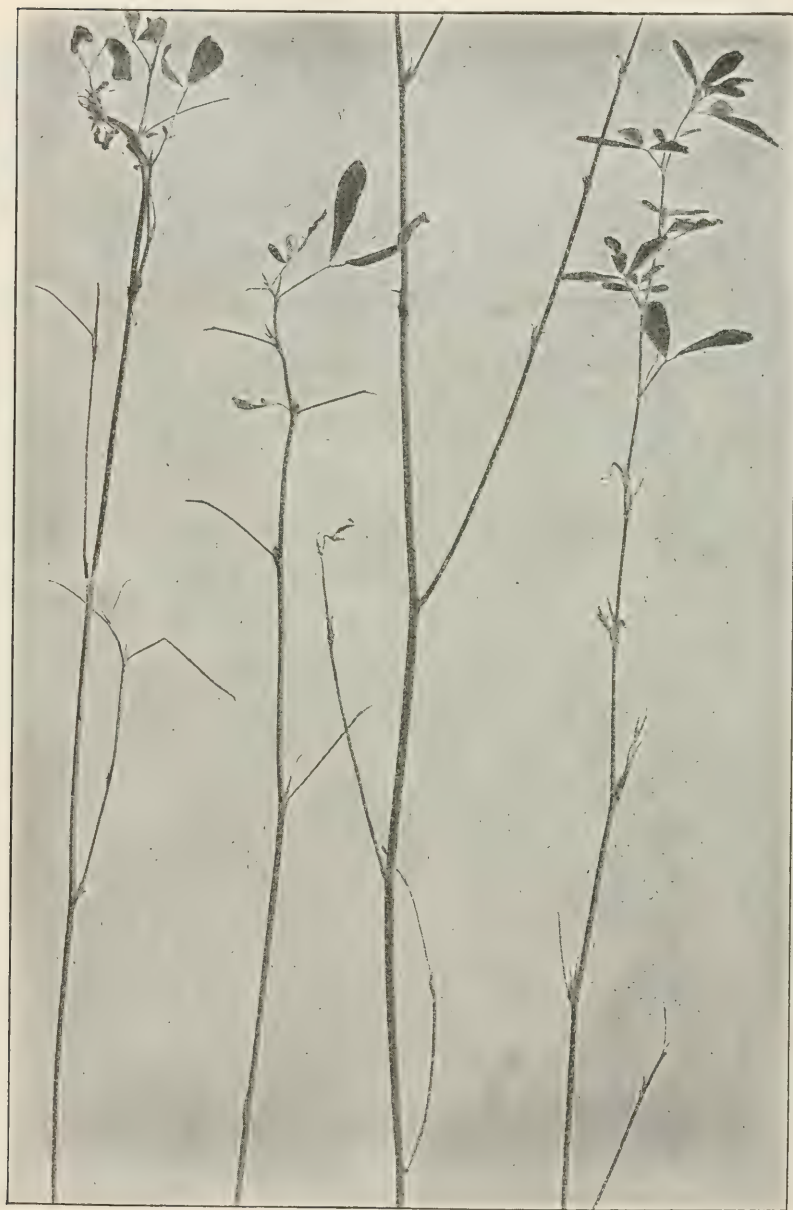


FIG. 673.—THE ADVANCED STAGES OF THE LEAF SPOT ON ALFALFA. COMPARE THIS WITH FIGURE 10.

ANTHRACNOSE

When affected by anthracnose, *Colletotrichum trifolii* Bain, black spots are produced on the stems and petioles, and, rarely, on the leaves of clover and alfalfa. It may be very severe in some cases. Alsike clover seems to be almost immune.

The only control known is by selection of seeds from resistant plants. In order to be sure that such plants are secured, they should be selected from a field in which the disease is severe. In subsequent planting of this seed, precautions must be taken to have an abundance of old, diseased plants scattered around to test the clover thoroughly and kill out all plants that are not resistant. Continued selection is necessary to eliminate all but thoroughly resistant plants.

SUGGESTIONS FOR OBTAINING A STAND OF ALFALFA

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One frequently meets the statement made by alfalfa enthusiasts that "alfalfa will grow anywhere if you manage it right." If the statement implies growing it cheaply enough and successfully enough to be profitable, it certainly is not correct. Alfalfa is one of the most exacting crops regarding soil, and its culture cannot be extended very far toward the north. Alfalfa will stand quite severe winters, if growing in a soil that is thoroughly well drained and where it is protected by a good covering of snow throughout the severe weather. Lacking these conditions, it is quite sensitive to severe cold.

SOIL

The character of the soil is the most important factor in alfalfa growing. A good alfalfa soil must be permeable; it must be fertile; it must be alkaline.

The soil must be permeable so that adequate drainage may be secured. Alfalfa will not grow in a water-saturated soil, and undrained soils heave so badly in winter as to destroy the plants. A certain degree of permeability also is necessary, in order that the roots may penetrate the soil readily. Normal alfalfa has taproots that penetrate the soil deeply. Diffuse-rooted and more shallow-growing varieties are being developed, which seem to endure shallow soils and severe winters better than the ordinary variety. Alfalfa roots will penetrate quite heavy clay loam soils, but the stand is likely to be rather short-lived in such soils. The roots will not penetrate hard-pan soils, and the faulty drainage of hardpan soils almost always leads to the loss of the plants by

winterkilling. It probably is not worth while to try to grow alfalfa on hardpan land.

Young alfalfa plants are weak, and they are rather slow growers. It seems necessary to have the soil in quite fertile condition in order to get a good stand of healthy, vigorous plants. If the soil is not physically well adapted to alfalfa, it becomes even more important that it be in a highly fertile condition. Under such circumstances a liberal dressing of manure while preparing the land seems necessary. If stable manure is not available, a green crop may be plowed under and mineral fertilizers added.

Alfalfa, like nearly all legumes, requires much lime for its proper nutrition. The soil must also be alkaline in order that nitrogen-gathering bacteria may thrive in it. It therefore becomes imperative that, to grow alfalfa successfully, a soil must be abundantly supplied with lime. So important is lime in alfalfa growing and so general is the lack of it in New York soils, that no one should omit its use in fitting land for alfalfa, unless experience with the particular soil has distinctly shown that it is not needed.

SEED

A prime factor in successful alfalfa growing is good seed. The seed should be at least 99 per cent pure, and should not contain any pernicious weed seed, especially dodder. The New York law requires dealers offering seed containing 3 per cent of foreign seed to brand it, giving the percentage of such foreign seed; but, unfortunately, the law does not require them to state the kind and amount of pernicious seeds present. The buyer should require a guarantee from the dealer that no dodder is present or else submit a sample of the seed to the State Experiment Station at Geneva for examination. Not only should the seed be pure, but it should be alive. Dead alfalfa seed is of no more value than inert matter. A germination test should be made unless the seed is brought from a reliable dealer under a guarantee.

Not only should the seed be good, but it should be adapted to the locality. This statement applies especially to the borders of the alfalfa-growing regions and to those places where difficulty is experienced with the crop. Until recently alfalfa seed was alfalfa seed, and that was all there was to say. Now hardy varieties

have been introduced, which often succeed where the ordinary commercial stock will fail. The hardy varieties usually have diffuse or branched root-systems instead of the taproot and are able to withstand harder soil and climatic conditions. The so-called hardy sorts are not superior to the ordinary stock except in hardiness. Where the ordinary seed does well there is no advantage in paying the extra price of the hardy. Furthermore, some unscrupulous dealers will sell ordinary seed for hardy when they have an order for the latter, so the buyer must be sure of his dealer if he orders it. Many new varieties are being tested, but few of them are yet available except for experimental purposes. Varieties known as Grimm and Baltic have been quite thoroughly tested out and the seed is on the market in moderate supply.

Twenty or twenty-five pounds of seed per acre are usually sown, and with good seed and favorable conditions fifteen will do as well.

INOCULATION

Inoculation with nitrogen-gathering bacteria has come to be regarded as a necessary practice in new alfalfa districts, but is not necessary on land that has previously grown alfalfa successfully. Various methods of inoculation are practiced, but probably the most satisfactory is by means of cultures secured from various experiment stations. New York farmers can secure the cultures at very moderate cost by addressing the Experiment Station at Ithaca.

PREPARATION OF THE SEED BED

The conditions sought in a seed bed for alfalfa are a firm subsurface, a fine surface, freedom from germinating weeds, and an alkaline soil. If the land is intended for spring seeding, the firm subsurface can best be secured by fall plowing. The proper use of the disc and harrow on fall-plowed land will produce a fine, mellow surface. Land that is comparatively free from weeds may well be prepared this way. If the land is spring-plowed, it should be recompactd by thorough harrowing and rolling before seeding. A good soaking by rain after plowing will help very much in recompactd the soil. Fallow ground is more favorable for alfalfa seeding than sod land. If sod land is used, the greater care must be taken to get it well settled and compactd.

Alfalfa does not usually produce a satisfactory crop the same season it is seeded, though if seeded early and the season is very favorable a good crop may sometimes be secured. To avoid the loss of a season's use of the land, a crop of peas and oats is often grown for forage. This crop is a good preparation for alfalfa, and if sown as early in the spring as possible on fall-plowed land it is usually out of the way so as to allow August seeding. Whether or not the land should be replowed depends upon the amount of rubbish left after harvesting the peas and oats. If a nice, fine, clean seedbed can be secured without replowing, it is just as well. The chief objection to growing the forage crop before seeding to alfalfa is that the soil may be left too dry to germinate the alfalfa seed unless there are frequent rains.

LIME AND FERTILIZERS

Liming and manuring should be considered in connection with the fitting of alfalfa land. These are more important outside the recognized alfalfa district than in it. Outside the alfalfa belt, both of these treatments should be considered a regular part of the program. Lime, of course, can be had by paying the price. Manure sometimes is not on hand and cannot be purchased. A fairly good substitute for manure is a green manure crop to turn under and some commercial fertilizer. The land may be plowed in the fall and sown thickly to rye, say three bushels to the acre, using two hundred to four hundred pounds of a good, complete fertilizer. When the rye is from $1\frac{1}{2}$ to 2 feet high it should be plowed under and the land should be thoroughly compacted and seeded in July, using an additional amount of fertilizer. In the same way, buckwheat may be used instead of rye, sowing in the spring as soon as danger from frost is past.

Lime is necessary in order to succeed with alfalfa, except in the best alfalfa sections, and in these sections it is probable that dressings of lime will increase the yield sufficiently to warrant its use. The amount that should be used will vary greatly with different soils. Soils known to be acid probably should receive one to two tons per acre of fresh burned lime or from two to four tons of fine ground lime rock. Other soils may be equally well supplied with half these amounts. It is usually advised to work

the lime into the soil while fitting the seed bed, but it probably will be equally or more effective, in case of land that is in a cultivated state the previous season, to apply the lime with the previous crop. Lime acts slowly, and it may be well to have it on the land some time before the alfalfa is sown. Whether burned lime or ground rock should be used is altogether a question of expense, remembering that one ton of quick lime is equal in efficiency to about two tons of ground rock.

WEEDS

Weeds are serious troubles in alfalfa growing. In fitting alfalfa land, every opportunity should be used to destroy successive crops of germinating weeds by repeated harrowings at intervals of ten days or two weeks. This is another important reason for plowing the land a considerable time before the seeding is to be done.

TIME OF SEEDING

The time of seeding is very much influenced by the weed situation. If the land is clean, there is no better time than in the spring, just about early corn-planting time, but spring seeding is much more affected by weeds than late seeding; it has therefore come to be quite a general practice to seed in early August. I am of the opinion that late July is better than August. It certainly is better than late August. Seeded in July or August, there is good opportunity to clean the land and the weeds do not interfere very much before they are cut by frost. The next spring, being already well established, the alfalfa takes the land before the weeds start.

METHOD OF SEEDING

In the favored alfalfa sections the crop is seeded with a grain crop in the same manner as clover. Under less favorable conditions it is best to seed it alone. The seed may be sown broadcast by hand or with the ordinary grain drill and lightly harrowed in, or it may be drilled in with one of the new clover and alfalfa drills. These drills are especially helpful when seeding in fall-sown wheat. In this case the surface is usually somewhat crusted, so that seed scattered on the surface does not become covered sufficiently to insure full germination. The drill secures a light, uniform covering that usually results in full germination.

RESULTS IN GROWING ALFALFA OBTAINED ALONG THE LINE OF THE LEHIGH RAILROAD IN CENTRAL NEW YORK

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During the past three years we have made strenuous efforts to grow alfalfa upon that portion of the territory along our line which is not naturally adapted to the taprooted variety that is in common use throughout the East. All that portion of our road lying west of Burdett, Schuyler County, including the A. & I. Division, with the exception of a few unfavorable spots, are naturally adapted to the growing of common alfalfa; in these sections its use has spread decidedly and is gaining more and more



FIG. 674.—YEARLING ROOTS FROM A FIELD OF ORDINARY ALFALFA, SEEDED
TWENTY POUNDS PER ACRE.

favor among our farmers as their principal forage crop. The progress in these sections has been entirely satisfactory.

Our greatest difficulty seems to be the growing of this crop on soils that naturally have a wet subsoil and heave or throw out the taprooted plant during the spring of the year. Until within the past few years, little attention has been given to the question of alfalfa varieties in the East. The type of seed in common use

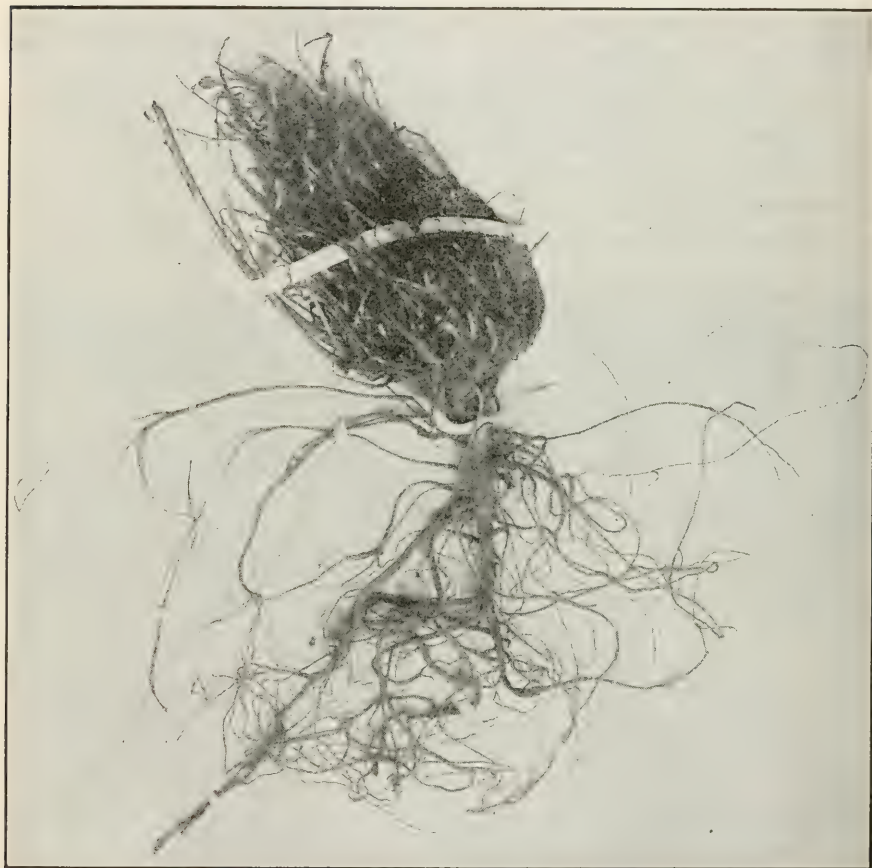


FIG. 675.—TYPICAL GRIMM ALFALFA PLANT, TWO YEARS FROM SEEDING.

is not true to any well-defined variety. The result of using this seed indiscriminately has been a total failure of the crop in many sections, due largely to heaving.

Fig. 674 shows eight yearling plants taken from a field seeded with the so-called common variety. It will be noted that five of

these plants have simply a straight taproot with small, weak lateral roots; two have a slight tendency to branch; and one has a decided tendency to branch. In short, common alfalfa is not true to any type. This last accounts for the condition that, where a field of alfalfa has been heaved out, occasionally a plant is found in the field that did not heave. An examination of the roots of this surviving plant will show that it is of the branching-root

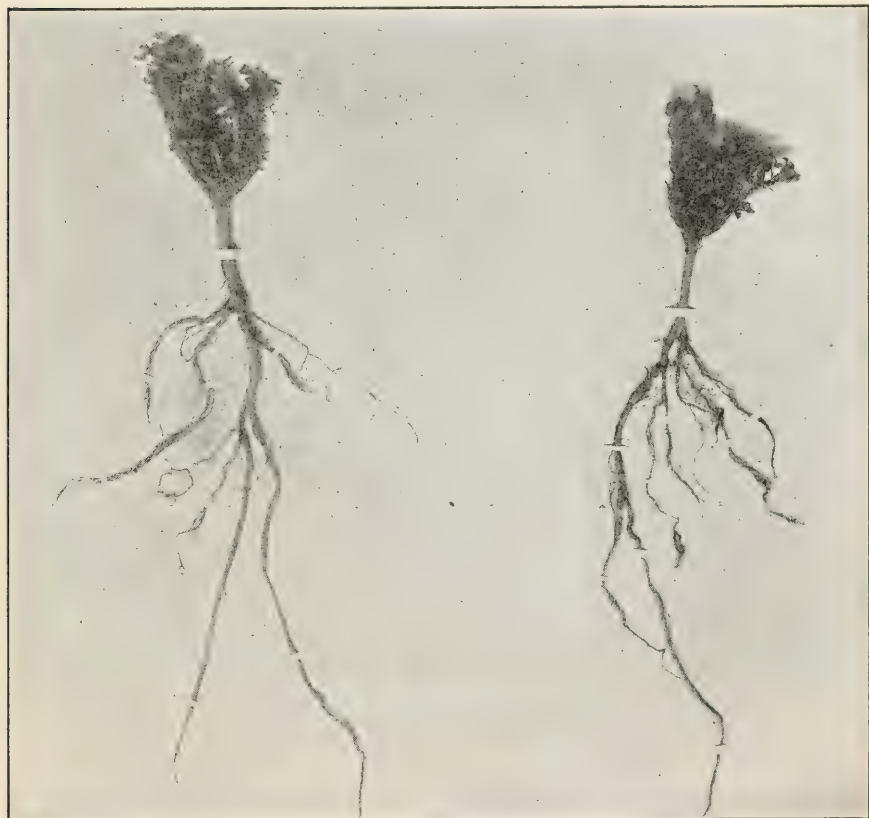


FIG. 676.—BALTIC ALFALFA.

variety. This so-called common variety with the straight taproot has a value above all other varieties in that it will go very deep into the soil for water, and so avoid drought, and, in types of soil that are deep and well drained, where there is little heaving, no better variety could be found, provided it is grown well north and is therefore hardy.

We became convinced that in order to grow alfalfa upon heavy soils we must use the spreading-root varieties, the seed of which was very scarce and expensive. In order to facilitate the growing of alfalfa on the hardpan volusia silt soils, our railroad in 1913 distributed a small amount of seed to each of about fifty farmers that owned hardpan land and were anxious to grow alfalfa. For this purpose the Grimm alfalfa was selected, Fig. 675, showing

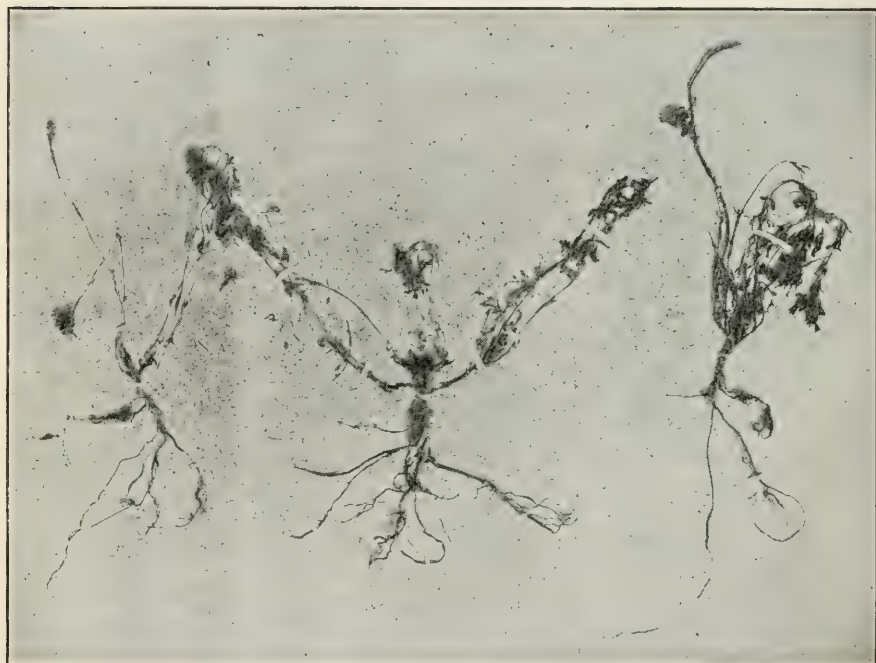


FIG. 677.—“LEHIGH” ALFALFA. A FALCATA VARIETY, FROM A PLANT FOUND ON RIGHT-OF-WAY OF THE RAILROAD.

a typical two-year-old Grimm plant with the spreading root, which holds it in hardpan soils. This seed was to be put out in plats twenty-eight inches apart, for the purpose of producing seed. Without an exception, these plats were successful; although put out under most adverse conditions, there was no report that there was any considerable heaving in any one of them. In several cases most successful crops of seed were taken, sufficient in at least four cases to seed ten acres. In addition to this some of our

farmers purchased the seed, even when the price was at that time a dollar a pound, and seeded this Grimm variety as a meadow.

Such a meadow seeded in 1913 on volusia silt soil yielded $4\frac{1}{2}$ tons per acre. On this meadow there was no heaving, although the ordinary variety heaved out on an adjoining field.

Fig. 676 shows the type of Baltic alfalfa, which, although it has a taproot, also has heavy laterals, thus giving it a more hardy growth and the ability to penetrate more deeply into the soil after water.

Fig. 677 is an interesting plant grown from a seedling found on the right-of-way of our railroad. It will be noted that the root is a spreading type entirely, and that the branches start beneath the surface of the ground, running under the ground like a quack root and appearing at some distance from the main plant. We are developing this into a pasture alfalfa because, budding as it does beneath the ground, there is no opportunity for the hoofs of the animals to break the crown and so destroy it.

With this added information in the matter of varieties of alfalfa, we are now prepared to state that alfalfa can be grown successfully on any soil that does not lie under water any portion of the year and that has a depth of eight inches or more above hardpan or rock.

THE CULTURE AND UTILIZATION OF THE FIELD PEA

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INTRODUCTION

The field pea (*Pisum sativum*) is very closely related to the common garden pea, but the garden pea is cultivated primarily as a green vegetable, or as a grain crop for human food, while the field pea is grown for hay or for grain to feed to animals. In many cases, however, the same variety is grown for both purposes. (Fig. 678.)

Generally speaking, the varieties with wrinkled yellowish or greenish seeds and white flowers are classed as garden peas; while those with smooth seeds are considered field peas. Some field-pea varieties have yellow seeds and white flowers, while others have colored blossoms and brown, marbled, mottled, or speckled seeds.

On account of the fact that the field pea is more largely grown in Canada than in the United States, it is frequently called "Canada field pea," or "Canadian field pea." In the United States it has become a staple crop only in the New England States, New York, Michigan, Wisconsin, Minnesota, and the eastern Dakotas; but in Washington, Oregon, Idaho, and western Montana it has also been found well adapted to the climate and soil and is steadily increasing in importance as a farm crop throughout all the higher altitudes of the Rocky Mountain region.

CLIMATIC AND SOIL ADAPTATIONS

A cool growing season is essential for the field pea. High temperatures are much more injurious than frosts, which are disastrous to the crop only when they occur just at the period when the pods are setting. Its moisture requirements are less important than those of temperature; but, other things being equal, it does best where the rainfall is fairly abundant.

Long experience with the field pea has indicated that clay loams of limestone formation are best suited to its culture. As in the case with most other legumes, the field pea thrives best in a calcareous soil. Where the soil is not of limestone formation, it is advantageous to add lime frequently. Good drainage is essen-



FIG. 678.—FRUITING BRANCH OF A FIELD-PEA VINE, SHOWING THE CHARACTERISTICS OF STEM AND LEAF AND THE SUCCESSION OF BLOOM AND PODS.

tial for success with the field pea. It grows well on moist soils, but will not succeed in locations where standing water occurs or where the soil is habitually soggy.

VARIETIES

The variety of field pea grown in any region depends primarily upon its adaptation to soil and climatic conditions and to the

object for which the crop is being grown, but local prejudice and the availability of seed peas also affect the choice. The best general-purpose pea and the most widely known is the Golden Vine. Short descriptions of the principal varieties follow:

Golden Vine. — The Golden Vine is a medium-early variety having a white blossom and a small, round, cream-colored seed. It has become popular in the United States on account of its uniformly good yields of both forage and seed and the fact that it is usually easy to obtain. The small seeds also make the cost of seeding less.

French June. — This is one of the best early varieties. It has white blossoms and is almost identical in seed characters with the Golden Vine, but it matures nearly two weeks earlier and the vine is not so large. In spite of these differences considerable confusion exists in respect to these two varieties, and the Golden Vine is often sold as French June.

Marrowfat. — This group of varieties is known to the seed trade under the names Marrowfat, White Marrowfat, and Large White Marrowfat, besides many other more distinctive varietal names, such as Canadian Beauty, Arthur, and Potter. The Marrowfat varieties have white blossoms, large, round, cream-colored seeds and large vines. All are rather late in maturing.

Blackeye Marrowfat. — This group of varieties has seeds very similar to those of the regular White Marrowfat except that they have a black hilum, or "eye." As a rule, the peas of this group mature a little earlier than those of the Marrowfat and the vine growth is less. Among the named varieties which belong to this group are the Paragon and the Mackay, two varieties which are among the best yielders in Canada.

Prussian Blue. — This is also a well-known variety. It has white blossoms and medium-sized, round, bluish-green seed. The vines are large and it is rather late, maturing about the same time as the Marrowfat. The Prussian Blue is quite popular, as it makes good yields of both hay and seed.

Wisconsin Blue. — This variety is very similar to the Prussian Blue in seed characters and also has white blossoms, but it is a little

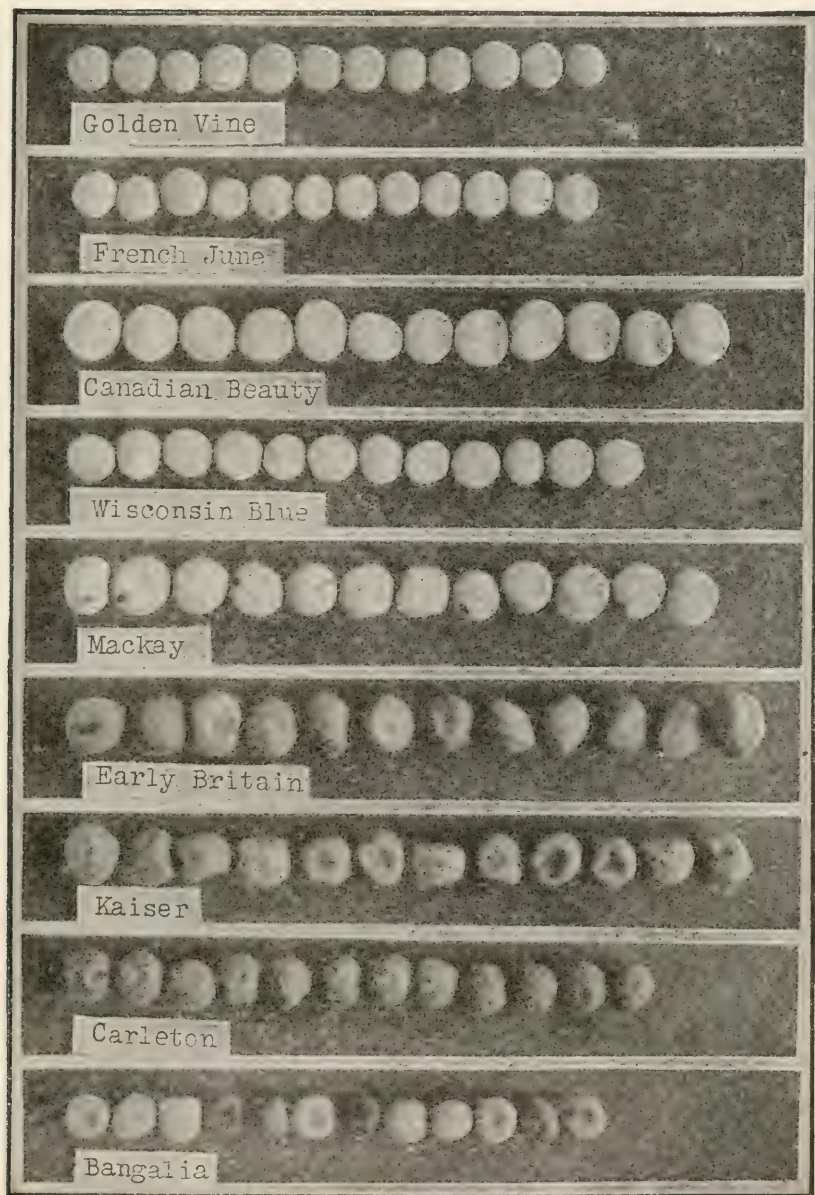


FIG. 679.—SEEDS OF SEVERAL IMPORTANT VARIETIES OF FIELD PEAS, SHOWING THE MOST COMMON SIZES, SHAPES, AND COLOR MARKINGS. (NATURAL SIZE.)

later in maturing. Like the Prussian Blue, it is quite popular in the northern United States.

Other rather important blue-seeded varieties which might be mentioned are Scotch, Blue Imperial, and Concordia. The whole group of blue-seeded field peas is grown rather extensively in the lake region of the United States, where they are utilized both for canning and for stock feed.

Early Britain.—The Early Britain is a very distinct variety, having medium to large brown-colored seeds, which are dented on the sides, giving them a somewhat wrinkled appearance. It has colored blossoms and a rather stocky vine with large leaves. The Early Britain is about three or four days earlier in maturity than the Golden Vine and is one of the leading varieties in Canada.

Gray Winter.—This variety, also called “English Gray,” is one of a group of varieties having small round seeds, gray in color, marbled with brown. The vines are small and the blossoms colored. The Gray Winter is supposed to endure lower temperatures than most field peas.

Carleton.—This field pea, which is similar to the Gray Winter, was obtained from New Zealand and has proved to be of special importance in the dry regions of Washington and Oregon.

Bangalia.—This variety, secured from India by the United States Department of Agriculture, is fast becoming one of the leading field peas of eastern Washington, northern Idaho, and western Montana, where it has made consistently good yields both with and without irrigation. It resembles the Golden Vine in size of vine, date of maturity, and shape and size of seed. The seeds, however, are greenish in color, turning brown with age. The blossoms are colored.

Kaiser.—The Kaiser is a variety introduced from Germany by the United States Department of Agriculture. It has medium to large, deeply dented seeds, gray in color, and speckled with purple. The stems also are strongly tinted with dark red. It matures with the Golden Vine or a little earlier and is a good general-purpose pea. A marked peculiarity is its ability to endure high temperatures, which should make it of special importance on the southern edge of the pea-growing district.

DIRECTIONS FOR SEEDING

Most growers claim that it is advantageous to plow the land in fall for the field pea, on account of the necessity for early seeding. Spring plowing is satisfactory if it can be done early, and where the seed is to be broadcasted by hand it is easier to cover it properly on freshly turned land than on plowed land that has been allowed to settle during the winter. Where the ground is plowed in fall it is well to work it with a disk as early as possible in spring and smooth it down after the disk with a drag harrow in case the seed is to be planted with a drill. If one expects to sow the field peas by hand, the ground may be left slightly rough and the seed covered with a disk harrow. Finely pulverized soil is advantageous for the field pea, but not so necessary for it as for the small grains, since the seed is much larger and the small plant correspondingly stronger.

An important thing to remember is that the field pea must be planted early enough to have time to set its pods before the warm weather of summer arrives. High temperatures are of value to the pea crop only during the ripening period. The young plants are not harmed by light frosts, and even as far north as southern Canada the seed can be planted during the latter part of April and the first of May.

The rate of seeding must be varied according to the size of the seed. In New York, small-seeded varieties like the Golden Vine should be sown at the rate of $1\frac{1}{2}$ to 2 bushels to the acre; for those with medium-sized seeds, 2 to $2\frac{1}{2}$ bushels; for the large-seeded varieties, like the Marrowfat, 3 to $3\frac{1}{2}$ bushels of seed are required. For a mixture with oats, the relative proportions should be 1 bushel of peas to $1\frac{1}{2}$ or 2 bushels of oats.

The field pea is best sown with a grain drill, and if either a hoe drill or a disk drill is available it should be used in preference to broadcasting the seed by hand. In clay loam a depth of two inches is best, while in sandy soils a deeper covering is to be preferred. Where a grain drill is not available, peas may be sown broadcast and covered with a disk or drag harrow. Care must be used to see that the feed in the drill does not crack the seed. For sowing peas, a drill in which the amount of seed delivered is con-

trolled by the size of the opening in the feed rather than by the rapidity of its motion is essential.

To secure the best results, field peas, like all other legumes, must have upon their roots nodules caused by nitrogen-fixing bacteria; however, since the almost universal use of the pea as a garden vegetable has supplied the soil in New York with the necessary bacteria, it is not usually necessary to inoculate the soil artificially.

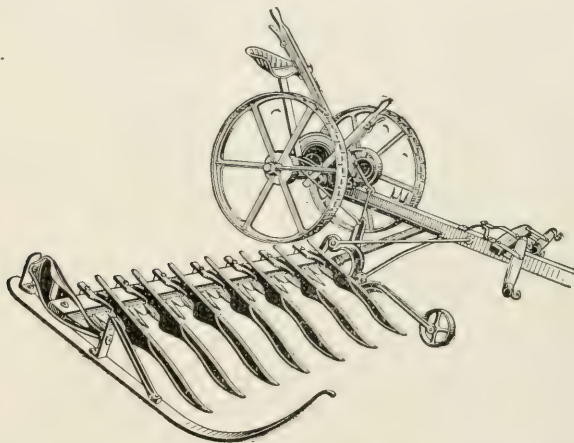


FIG. 680.—A MOWER SHOWING AN ATTACHMENT DESIGNED TO RAISE THE PEA VINES OFF THE GROUND AND ALLOW THE PASSAGE OF THE CUTTER BAR BENEATH THEM.

HARVESTING THE FIELD PEA

The proper time to cut peas for hay is when most of the pods are first formed. When seeded in mixtures with grain, the time of cutting may be governed to some extent by the maturity of the grain, but the varieties of peas and grain used in the mixture should be so chosen that the crop can be harvested at the most favorable period of maturity for both.

Formerly, a crop of field peas was considered very difficult to harvest, and much of the harvesting was done with a scythe or an old-fashioned cradle. There is an attachment for the ordinary mower now available, however, which consists of guards that extend in front of the cutter bar, lifting the vines off the ground and allowing the mower to pass underneath without becoming

entangled in the vines themselves. (Fig. 680.) The cost of this attachment is usually from \$12 to \$15. There is also a windrow attachment that effectually removes the peas from the swath and leaves them in a windrow behind the mower. (Fig. 681.) Where such an attachment is not used, it is necessary to have a man follow the mower with a fork and move the vines to one side, to prevent the team and mower from passing over the peas in the following round. A mower fitted with the above attachments works well in fields that are smooth and free from stones. The peas can be left in the windrow or bunched with a rake and left

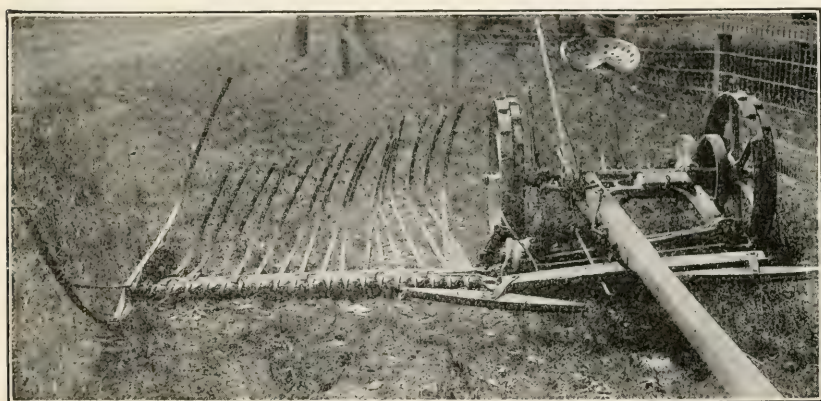


FIG. 681.—A MOWER WITH A WINDROW ATTACHMENT WHICH AUTOMATICALLY REMOVES THE MATERIAL FROM THE SWATH.

until dry and ready to stack. It is a common practice in some localities to harvest the crop by pasturing with hogs or sheep. This is done more largely in the San Luis Valley of Colorado than in any other part of the United States, and is a wise practice only where the fall and winter are dry and free from snow.

The field pea should be cut for seed when the pods are fully mature and the peas have become firm. It is not well, however, to wait until the vine and pods are both dry, since if that is done the loss from shattering is certain to be large. In a great many cases the field pea is thrashed directly from the bunch or windrow, as it is very difficult to construct a stack that will shed water. If the peas are rained on during the period while they are curing in the windrow or in bunches, they should be turned over as soon

as the top of the bunch is dry. If this is not done the peas underneath will swell and burst the pods, and when they become dry a great percentage will shell out and be left on the ground. When stacked in the open it is necessary to protect the stacks by means of canvas covers or with a layer of green grass placed over the top.

THRASHING

The thrashing of the field pea is usually done with an ordinary grain separator fitted up especially for the pea by the substitution of blank concaves, leaving only one row of concave teeth below the cylinder. Usually four concave teeth are sufficient to retard the passage of the vines long enough for the cylinder to break the pods and release the seeds. (Fig. 682.) By thus limiting the number of concave teeth and greatly reducing the speed of the cylinder it is possible to thrash the field pea without cracking any considerable percentage of the seed. In regions where the field pea is very largely grown, the thrashing machine is commonly equipped with an adjustable pulley wheel made of wood, which can be bolted to the regular cylinder pulley, thus making this pulley large enough to decrease the speed of the cylinder to the required number of revolutions. Where the peas are intended wholly for feeding purposes such precautions are not necessary, since cracked seed is then not objectionable.

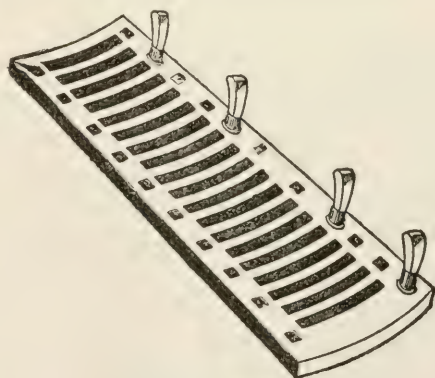


FIG. 682.—CONCAVE PLATES WITH ALL BUT FOUR TEETH REMOVED, ADJUSTED FOR THRASHING FIELD PEAS.

FIELD PEAS AS A GRAIN CROP

Field-pea seed has been used quite extensively by the farmers of Ontario in feeding farm animals; and beef, mutton, and pork produced with a ration composed partly of field peas is said to have a particularly agreeable flavor.¹ Feeding experiments, however, indicate that the peas used alone as the grain part of a ration are no better than corn, bushel for bushel, in amount of gain produced and are a much more expensive feed.²

The field pea is reported also as being very efficient in a ration for milch cows, especially when the peas are mixed with oats.³ It is doubtful whether a feeder is ever justified in using field-pea seed alone, for several reasons. When ground or crushed, the meal is heavy and hard to digest; in addition to this failing, it is too high in protein and too low in fat to make its use as a concentrate economical unless it is mixed with other grain feeds strong in fat and carbohydrates. Table I, from Wyoming Agricultural Experiment Station Bulletin 84, illustrates this point.

TABLE I.—COMPARISON OF THE DIGESTIBLE NUTRIENTS IN FIELD PEAS AND CORN

FEED	PROTEIN	CARBO- HYDRATES	FAT
	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>
Peas.....	16.8	51.8	0.7
Corn.....	7.9	66.7	4.3

The proper place for the field pea in feeding operations seems to be in a mixture with oats, barley, corn, or wheat bran, being used as a carrier of protein in the northern feeders' ration much as cottonseed meal is used in the South.

¹ Day, G. E., *Bacon Production*. Ontario Agr. Col. and Exp. Farm Bul. 129, p. 15, 1903.

² Carlyle, W. L., *Feeding Ground Corn versus Ground Peas to Lambs before and after Weaning*. Wis. Agr. Exp. Sta. 16th Ann. Rpt. (1898/99, p. 44-61, fig. 4-5, 1899.)

Day, G. E., *Experiments in the Feeding of Live Stock*. Ontario Agr. Col. and Exp. Farm Bul. 110, p. 7, 1900.

Peas vs. Corn for Fattening Steers. Ontario Agr. Col. and Exp. Farm, 27 Ann. Rpt., 1901, p. 58, 1902.

³ Murray, James, *Experiments with Peas*. Canada Exp. Farms Rpts., (1908/09, p. 280-281, 1909.)

It is always well to grind the peas before feeding, as the seeds of most varieties are very hard. Except when fed to hogs, good results can not be expected unless they are ground before being given to the animal. Besides being used in the ordinary feed lot, a great many of the peas, especially in the eastern part of the United States and in southern California, are used by pigeon fanciers in the production of squabs and also by poultrymen as a constituent of their chicken feeds. A small round pea, similar to the Golden Vine, is preferred in such cases.

FIELD PEAS AS A HAY CROP

The field pea is commonly grown in New York for hay, and is almost always sown in a mixture with oats or some other small grain. These mixtures with grain stand up much better, causing less trouble in the harvest; the presence of oats or barley in the crop also causes it to cure more quickly. The yield from a mixture of oats and peas is usually larger than that from timothy. The field pea works into a rotation very nicely, because of the fact that when harvested for hay it is removed from the field early in the year, thus allowing time for a thorough preparation of the soil during the fall. The feeding value of pea hay is quite high, being apparently about the same as that of alfalfa hay.

Table II shows the average of all American analyses of field peas and alfalfa reduced to a dry-matter basis, as compiled by Mr. G. L. Bidwell, of the Bureau of Chemistry, United States Department of Agriculture.

TABLE II.—COMPARATIVE ANALYSES OF DRY MATTER IN FIELD PEAS AND ALFALFA

CROP	ASH	PROTEIN	CRUDE FIBER	FAT	NITROGEN FREE EXTRACT	NUMBER OF ANALYSES
	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	
Field peas	8.68	19.05	28.14	3.23	39.75	15
Alfalfa	8.86	16.35	26.74	3.00	45.05	44

Even the straw from thrashed peas carries a sufficiently high percentage of protein to warrant its careful preservation and use as feed.

FIELD PEAS AS SILAGE

It is not economical to put the field pea in the silo alone, on account of its high protein content. It makes a better-balanced ration and keeps better when combined with some small grain, which should be mixed with the peas in sowing if the crop is intended especially for ensilage. The chief source of pea ensilage is the refuse of pea canneries. This material is not often placed in a regular silo, but is stacked up green as it comes from the cannery and allowed to ferment in the stacks. The surfaces of the stacks that come in contact with the air always spoil; however, twelve or eighteen inches below the surface the material will be found packed down closely and in good condition, if the stack has been well built. (Fig. 683.) Feeding tests made with pea silage preserved in this way indicate a very high value, especially for dairy cows.¹



FIG. 683.—A STACK OF PEA-VINE REFUSE FROM A CANNING FACTORY AT GENESEO, N. Y. NOTE THE INCLINE UP WHICH THE LOAD OF REFUSE IS HAULED TO BE DUMPED ON THE STACK.

VALUE OF FIELD PEAS IN ROTATIONS

The value of the field pea in rotations with hay, grain, and corn crops has been proved. In the northeastern and north central states,

¹ More detailed information on this practice will be found in Bureau of Plant Industry Circular 45, *The Utilization of Pea-Cannery Refuse for Forage*.

where rotations are regularly practiced, the field pea usually follows the meadow crop. In practice, it is found that the crop of field peas is very effective in furthering the disintegration of the sod left by the grass. It is this fact which has determined its position in the rotation. The ground is left by the peas in especially good condition for a wheat crop, and the increase in yield of grain due to a preceding crop of field peas has been quite marked.

DISEASES OF THE FIELD PEA

Powdery Mildew

Powdery mildew, *Erysiphe polygoni* DC., is usually most destructive on late-planted or late-maturing varieties of field peas. It is also confined rather closely to humid climates, where it sometimes reduces the yield considerably. The remedy for this disease lies for the most part in the rotation of crops; but, where only small portions of a field are affected, the disease can be controlled by spraying with bordeaux mixture. If large areas are affected it is not economical to spray.

Leaf-spot or Pea-blight

Another disease which has been troublesome in the pea-canning districts of both Wisconsin and Ohio¹ is the leaf-spot or pea-blight, *Ascochyta pisi* Lib. This disease can be controlled in the same way as powdery mildew by spraying with bordeaux mixture where the area affected is small, but in large fields the farmer must depend upon the rotation of crops. Although the disease is carried on the seeds, treatment of the seed with insecticides or hot water is not effective, because the germ of the seed is injured by the treatment more quickly than are the spores of the fungus.

¹ Van Hook, J. M., *Blighting of Field and Garden Peas, Chiefly Due to Seed Infection—Powdery Mildew of the Pea*. Ohio Agr. Exp. Sta. Bul. 173, pp. 231-249, 12 figs., 1906.

Russell, H. L. *Pea Blight*. Wis. Agr. Exp. Sta. Bul. 228, pp. 4-6, fig. 1, 1913.

INSECT ENEMIES

Pea Weevil

The pea weevil (*Larid pisorum* Linn.), the most serious enemy of the field pea,¹ is a small grayish or brownish-gray beetle, marked with lighter spots. The insect lays its eggs on the young pod. This egg hatches and produces a larva, which bores through the wall of the pod and enters the young pea, where it feeds on the growing embryo and later pupates. The pupa remains in the seed until the next season, usually emerging from the pea the following spring. However, the behavior of the weevils is unfortunately not uniform in this respect, as many of them emerge sooner, and the dates of emergence will range from harvest to planting time the following year. One remedy for the attacks of the weevil is to store in tight bags the seed intended for planting and hold it over for one year, in which case the beetle will emerge from the seed and die before the next planting season arrives.

Another method employed by seedsmen is to fumigate the seed with carbon bisulphide, which can be obtained at a reasonable cost from any druggist. In applying this remedy the seed must be placed in a tight box or barrel and exposed from 30 to 48 hours to the fumes of this liquid. The carbon bisulphide should be exposed in a shallow dish placed on top of the peas, since the vapor is heavier than air. When mixed with air, this vapor is quite inflammable. Hence, care should be taken not to ignite it in any way, or a serious explosion may occur. One pound of the liquid is usually considered sufficient to fumigate 100 bushels of peas, but it is well to use somewhat more than this in order to be sure of killing all the insects.

Continuous cropping of the land to the field pea is almost sure to mean a constant increase in the numbers of the pea weevil. Practically the only remedy for this state of affairs is to stop growing peas for several years, in which case the weevil will be exterminated through lack of food.

¹ Chittenden, F. H., *Insects Injurious to Beans and Peas*. U. S. Dept. Agr. Year Book for 1898, pp. 233-260, figs. 66-82, 1899.

Pea Aphis

Another insect which occasionally does considerable damage is the pea aphis, or plant louse (*Aphis pisi* Kalt.). It has appeared in pea-growing sections at intervals and practically destroyed the season's crop, but it does not stay with the crop so continuously year after year as does the weevil. The aphis increases rapidly during a period of warm, dry weather; but a heavy rain, even when the insect is abundant, will sometimes free the vines almost entirely from it. Unless some weather condition acts in this way to destroy the pest, the only hope of the farmer is for the parasites of the aphis to increase sufficiently in numbers to overcome and destroy it.

VETCH

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Farm Bureau Manager of Jefferson County



All vetches adaptable to the agriculture of New York State as forage plants, soil improvers, and cash seed crops are economically important and should be so considered. In fact, each plant that belongs to the legume family and can be included among the farm crops in this state should be so included to fortify our agriculture against the time when our farms will of necessity become self-sustaining. More and more our farms will be called upon

to produce the required protein forage crops to sustain their quota of live stock. No group of plants will supply so much to the permanency of agriculture in the state of New York as the legumes. Among these should be considered the vetches.

KINDS OF VETCH

Botanists recognize more than 120 species of *Vicia* (vetch). Most of these are found growing wild in various parts of the world. In the United States, in addition to the cultivated sorts, there are at least 20 wild varieties. Among the economically important varieties in New York State we recognize at the present time chiefly two: common vetch or tares (*Vicia sativa*); and hairy, sand, or winter vetch (*Vicia villosa*). Vetches are valuable chiefly because of the fact that they are leguminous plants rich in protein, hence desirable for forage; nitrogen-gatherers, hence desirable in soil-improvement work; and also because they appear to be adaptable to a wide range of soil conditions.

Common Vetch or Spring Vetch (Vicia sativa)

This species of vetch is perhaps more widely recognized than others because it has been under cultivation for centuries. It is



FIG. 684.—TWO STALKS OF WINTER VETCH — 6 FEET LONG.

the "tare" of England so generally used as a forage crop. In habits it is strictly annual, growing in much the same manner as Canadian field peas. "The leaves are pinnate with about seven pairs of leaflets and a terminal tendril. The flower are violet-purple, rarely white, and born in pairs on a very short stalk." * The pods are rather long, brown in color, and contain five to seven slightly compressed seeds easily distinguishable from the black, spherical seeds of hairy vetch.

In New York State this variety is grown almost entirely as a forage crop, being handled in much the same manner as Canadian field peas. Owing to its trailing habit, it is grown with companion crops such as oats or barley and generally cut and fed green or cured for hay. Very little, if any, common vetch seed is produced in the state, although there appears to be no reason why seed cannot be produced.

As a general practice, common vetch is seeded in the early spring with a companion crop of oats or barley. The rate of seeding varies from 30 to 50 pounds of vetch with $2\frac{1}{2}$ to 3 bushels of oats per acre. The resultant crop makes a very satisfactory crop to cut and feed green, or the crop may be cut and cured as hay. It is seldom grown alone in this state. For the above purpose, however, it is doubtful whether common vetch is superior or even equal to Canadian field peas, which are grown in much the same manner.

The greater part of the seed of common vetch is produced in the states of Washington and Oregon.

Hairy, Sand, or "Winter Vetch" (Vicia villosa)

The second of the economically important vetches in New York State is hairy, sand, or "winter vetch." So many common names applied to the same plant may be confusing, but the habits and appearances of this variety are quite distinct and easily recognizable.

Hairy vetch, as it is more commonly known in this state, has either annual or biennial habits, depending on the time of year the seed is sown. It is winter-hardy in this state, whereas the common vetch is not. Experiences during the past five years

* Farmers' Bulletin 515, U. S. Dept. of Agr.

seem to indicate that this variety of vetch is more valuable for New York conditions than other varieties, because of the several uses to which it may be put and because of its apparent ability to grow well on a wide range of soils.

Its habits of growth are such that to harvest it successfully as a forage crop or seed crop it must be grown associated with oats, barley, wheat, or some other companion crop. As the stems are fine they do not grow erect, but trail over the ground or on plants with which it is grown. For cover-crop purposes this trailing habit is not objectionable and when used for this purpose it may be seeded alone.

"Botanically it is easily distinguishable from other varieties by the narrower, more numerous leaflets and the hairy, somewhat silver herbage. The flowers are blue-violet, born in one-sided clusters of about thirty on a long stalk."^{*} The seed pods of hairy vetch are characteristically flattened, particularly when immature.

SOIL REQUIREMENTS

As mentioned above, hairy vetch grows remarkably well on a wide variety of soils. This appears to be true throughout the greater part of the state where it has been included among the other leguminous crops. Even on soils showing a marked degree of acidity, large crops of vetch have been produced. Hairy vetch, therefore, has a wider range of growth than most legumes. In some parts of the state it does not appear necessary to inoculate the seed; in other parts inoculation is desirable. In general, therefore, where vetch is to be grown for the first time it would be advisable by all means to inoculate the soil or seed.

HAIRY VETCH AS A FORAGE CROP

It is only within the past five years that hairy vetch has been included among our leguminous forage crops. During this period it has attracted considerable attention and bids fair to become a valuable supplement to clover and alfalfa and to assume a permanent place among the leguminous forage crops of this state.

When hairy vetch is to be included in the average crop rotation it is seeded in the spring, usually with oats, clover, and grass seed.

^{*}Farmers' Bulletin 515, U. S. Dept. Agr.

The vetch seed, being too large to run through the grass-seed compartment of the grain drill, is mixed with the oats. The usual amounts of oats, clover, and grass seed are used, and to this is added 6 to 20 pounds of vetch seed per acre. Experience seems to indicate that in the northern part of the state 6 to 8 pounds of vetch per acre is abundant, while in the southern part 15 to 20 pounds gives better results. When hairy vetch is used in this manner it should be clearly understood that it is intended to supplement the other crops — not to displace them.



FIG. 685.—HARVESTING CROP OF VETCH AND CLOVER HAY.

That the presence of hairy vetch among the other plants increases the total yield of forage there is no doubt. Determinations in Jefferson County during the season of 1914 show that the addition of vetch increased the total yield of dry hay as follows:

	Pounds per acre
Yield of timothy, clover and vetch.....	4,530
Yield of timothy and clover.....	2,900
Gain due to presence of vetch in mixture.....	1,630

During the first season the hairy vetch grows with the oats, frequently making a growth of several feet but usually growing

as high as the oats. Ordinarily the plants flower when the oats are ripe but not mature seed. In seasons of abundant rainfall and delayed harvest, some plants may reach maturity and die during the winter. Any vetch among the oat straw manifestly makes the straw more valuable for feeding. If it is planned to cut the crop for hay or to cut and feed green, the amount of vetch seed used should be greater than above recommended for the reason that a maximum amount of vetch is desirable.

After the oats are harvested the vetch continues to grow, and frequently, before winter, covers the stubble and seeding with long, trailing vines. Some claim that this fall growth materially protects the seeding from winterkilling. The following season the vetch, being winter-hardy, grows with the clover and grasses and here reaches its maximum growth. Thus, in practice in this state, hairy vetch appears to grow nearly as large the first season as does the common vetch, and in addition supplements the new seeding crop the following year, after which it disappears.

FEEDING VALUE

According to analyses,* winter vetch leads all other legumes in protein content as indicated in the following table:

Dry fodder	Water	Ash	Protein	Fiber	Nitrogen free extract	Fat
Vetch	11.3	7.9	17.0	25.4	36.1	2.5
Alfalfa	8.4	7.4	14.3	25.0	42.7	2.2
Red Clover	15.3	6.2	12.3	24.8	38.1	3.3
Wheat Bran	11.9	5.8	15.4	9.0	53.9	4.0

This being true, it would seem to indicate that vetch has not been given adequate attention as a forage crop.

WINTER VETCH AS A SEED CROP

Growing winter vetch for seed has not yet assumed large proportions in this state, although the plants appear to set seed abundantly. In general, when vetch is grown for seed it is grown in combination with winter rye or wheat and is seeded at the rate of 20 to 30 pounds of vetch with 1 peck to 3 pecks of wheat or rye per acre. The time of seeding varies from August 25 to

* Jordan: *The Feeding of Animals*, p. 423.



FIG. 686.—WINTER VETCH PLANT SHOWING SEED PODS.

September 10. The seed crop is harvested the following July. When growing vetch with rye, the rye is inclined to predominate if more than one bushel of seed per acre is used in the mixture. The plan to keep in mind in working out this practice is to get a good stand of seed vetch with a minimum amount of rye or wheat. The only function the grain serves is to hold the vetch off the ground. The crop is harvested in the usual manner, thrashed, and the seed separated with considerable ease by using a spiral gravity vetch separator.

HAIRY VETCH AS A SOIL IMPROVER

Hairy vetch has been more generally used as a soil-improving crop or a cover crop than for forage. As a cover crop in orchards it protects the soil from washing during the fall and winter. The following spring it is plowed under or incorporated with the soil with special machinery, thereby greatly enriching the land.

When vetch is used alone as a cover crop, nearly one bushel of seed per acre is required. In combination with rye, 30 pounds of winter vetch and 30 pounds of rye per acre is recommended. At prevailing prices either of these mixtures are expensive. Another mixture including vetch is: vetch, 20 pounds; clover, 8 pounds; turnips, 8 ounces. The time of seeding cover crops, including vetch, ranges from August 10 to 25.

Farmers growing tobacco in the state have found that vetch and rye in equal parts is to be recommended as a cover crop following the tobacco harvest. The Government Station at Baldwinsville, Onondaga County, suggests 50 pounds of vetch and an equal amount of rye per acre. This is seeded between September 15 and October 1, after the tobacco crop has been harvested. This cover crop is plowed under the following year. The practice is reported to be satisfactory, although it would seem that the expense for this amount of vetch seed might justify a smaller seeding of vetch per acre.

Hairy vetch may also be used successfully as a cover crop in vineyards and in fields growing corn that are to be plowed in the spring. Where fall plowing is practiced, the vetch would not make sufficient growth to justify the extra cost of the seed.

In conclusion, it would seem a wise step for any farmer to learn more about the place and use of vetches on his farm. The best practices to be followed in growing this crop in different parts of the state have not yet been worked out. There is still need for some careful field trials to determine the best practice in handling this crop. For this reason the above recommendations are general rather than specific.

SOY BEANS

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Although the soy bean is a member of the great legume family, the botanists have placed it in a different genus from those to which our more common clovers and other legumes belong. Its scientific name is *Glycine hispida*. Like the garden bean, it is a tender annual, upright in its habit of growth, reaching a height of four feet in the larger varieties. It is characterized by numerous short hairs on both stem and leaves, which give it a soft, velvety appearance. The flowers are white or purple, not conspicuous, and are borne close to the stem. The seeds may be black, brown, green, or yellow, according to the variety, with from two to four seeds in each short pod. Its root system is rather limited, but has a short, strong taproot. The tubercles formed by the nitrogen-gathering bacteria associated with this plant are often as large as the seeds of the garden pea, and very prominent on the roots of well-inoculated plants.

HISTORY

The soy bean has been cultivated in China and Japan for many centuries. It is the most important legume grown in those countries. Its cultivation has spread slowly to other countries, reaching Europe in the latter part of the eighteenth century, and the United States as late as 1829 — the year in which Thomas Nuttall described its possibilities as a crop for this country, in the *New England Farmer*. The Perry expedition to Japan in 1853 brought back seeds of two kinds of soy beans for trial in this country. Thirty years ago our agricultural experiment stations first imported seed from Japan and aroused some interest among

farmers by experiments with soy beans. Private individuals took up the culture of certain varieties for seed as a farm specialty. For at least fifteen years, the seeds of several varieties have been commercially available to farmers.

In Asia, upwards of two hundred varieties have been grown and used mainly for human food. European and American tastes generally dislike the flavor of soy beans, but twenty or more varieties have gained a foothold in America as a forage crop, and the culture of soy beans has become of increasing importance, especially in those states where red clover does not thrive. The region of their maximum usefulness, as indicated by experiments and observation, seems to be south of the red clover area. In New York it seems safe to say that soy beans will succeed in about the same proportions that Indian corn succeeds. The climatic and soil requirements of the two plants are quite similar.

UTILITY

On account of their composition, soy beans have been found very beneficial in rations for cattle, sheep, and swine. The relatively high percentage of protein and fat in the seeds leads to the conclusion that they are the logical complement to carbonaceous foods like corn and grass. The following table of digestible nutrients in 100 pounds of the various soy bean products is compiled from *Feeds and Feedings*, by Henry and Morrison. It represents mainly the average results of American experiments with soy beans as stock food.

	Total dry matter	Crude protein	Carbo- hydrates	Fat	Total nutrients	Nutritive ratio
Soy bean fodder, green..	23.6	3.2	10.2	0.5	14.5	1: 3.5
Soy bean hay.....	91.4	11.7	39.2	1.2	53.6	1: 3.6
Soy bean seed.....	90.1	30.7	22.8	14.4	85.9	1: 1.8
Soy bean straw	88.1	2.8	38.5	1.0	43.5	1:14.5
Soy bean silage.....	27.1	2.6	11.0	0.7	15.2	1: 4.8
Corn and soy bean silage	24.7	1.6	13.8	0.8	17.2	1: 9.8

A little study of these results shows us that the soy bean seeds are a very high-class feed; but, as they are too expensive for that purpose as yet in this country, we need not dwell on their merits. The green soy bean fodder and the soy bean hay have been found both palatable and nutritious in a practical way. It will readily

be seen that the straw left after the removal of a crop of seed is not to be despised as a source of roughage for ruminants. The methods to be followed in growing soy beans for these several purposes are given below.

As a Soiling Crop

The best plan is to sow early, medium, and late varieties, in order to have the fodder in prime condition during a longer period. This may also be accomplished by sowing the same variety at different times. For example, by sowing Ito San, Medium Green, and Mammoth Yellow as early as the ground is warm enough for corn planting, one should have green soy bean fodder in good condition for a period of six weeks.

The soil preparation for soy beans is essentially the same as for a good crop of corn. The soy beans must have plenty of available nitrogen, either from manures or from inoculation and consequent tubercle formation on the roots. They respond well to phosphatic fertilizers, but are not so sensitive to the lack of lime in soils as are the clovers.

To produce a full stand of green fodder, it is probably best to sow the seed through a grain drill at the rate of 1 to 1½ bushels of seed per acre, according to the size of the seeds. The rows may be as narrow as twenty-four inches, thus allowing clean cultivation until the leaves begin to spread across the row. Cultivation is a considerable factor in securing good yields of fodder. With its aid one may harvest as high as ten tons of the green fodder per acre on good land. Thorough preparation of the seed bed before planting is very desirable, as it is with other intertilled crops. Harvesting may begin when the plants are out of bloom, and continue until the pods are filled.

For Silage

Essentially, silage is preserved green fodder, hence it follows that the same practices that will make a successful growth of soy beans for soiling will apply to the crop when grown for the silo. The chief differences are that only one kind need be grown, as the crop is all cut at once, and when it is ensiled it should be mixed with corn in the proportion of 1 part bean fodder to 3 or 4 of corn

fodder. By themselves, the soy beans make a strong-smelling silage, which is subject to putrefactive changes, as is the silage made from clover or alfalfa. Experience has shown that it is better to have the soy beans diluted with a more carbonaceous fodder, and corn is the one most easily grown to maturity at the same time as the soy beans. The beans should be podded but not ripe when ensiled. It has been found that the Medium Green variety is the one best suited to this practice in New York. It reaches maturity with the most popular varieties of corn and retains its abundant foliage longer after pods are filled than many other kinds.



FIG. 687.—MEDIUM GREEN SOY BEANS PLANTED IN HILLS OF YELLOW DENT CORN ON A FARM IN THE HILLS OF BROOME COUNTY, N. Y. THIS GROWTH WAS SECURED IN THE VERY DRY SEASON OF 1913.

Of course, the devotion of part of the corn ground to soy beans will mean a reduction of the tonnage of fodder harvested, but the advantage is in the improved quality of the silage and the consequent saving of purchased grain while feeding it. The combination of soy beans and corn is therefore recommended for the farms where it is usually possible to grow a heavy yield of silage

corn. It means growing less tons of corn, but filling the silo with a more nutritious fodder.

A number of farmers have tried to find ways of growing soy beans and corn together in the hill or drill row in order that the two crops may be already mixed when harvested. In this attempt some have been measurably successful. The soy bean seeds are mixed with the seed corn, or are dropped from separate boxes on the corn planter, or the soy beans are planted by hand in the corn hills as a separate operation. It should be noted that the more the corn shades the beans, the more slender and weak will be their growth. In order to give the beans more light and to increase the proportion of bean fodder in the mixture, one ingenious grower omits every third row of corn. He is able to harvest a mixed crop that is 20 per cent soy beans, while the full-stand-of-corn method will usually produce a mixture with about 5 per cent of soy beans. The effect of the soy beans on the growth of the corn varies under different circumstances.

Some growers observe that the growth of the corn is reduced by the presence of the soy beans. Others have seen their corn grow taller and color a deeper green where the soy beans were associated with them. In the former case it seems that the soy beans compete with the corn as do weeds for the available nitrogen; in the latter, it seems likely that the nitrogen-gathering quality of the soy beans is being utilized to the advantage of both corn and soy beans. The mixed crop is successfully harvested in bundles with a corn binder.

Soy Bean Hay

It is possible to harvest from one to four tons of very nutritious hay from an acre of soy beans. For dairy cattle it is the equal of alfalfa hay, but they must be accustomed to it before they will eat it readily. Cows have even shown a preference for soy bean hay over alfalfa after having both offered to them.

The best varieties for hay production are those which have a fine, slender stem. The Peking, a variety with small black seeds and a slightly trailing habit of growth, is recommended for this purpose. The seeding should be at the rate of from 1½ to 2 bushels per acre, using all the hoes of the grain drill. Without

the intertillage there should be thorough preparation of the seed bed, and a stand of plants that will keep down weeds by shading the ground completely. The seeding should be timed so as to cure the crop early in September at the latest.

The curing of the hay is the most difficult part of this proposition. It requires from three to six days of good hay weather to cure soy beans properly. In bad weather, special curing-frames may prevent losses. As the leaves are the most valuable part of the fodder, it is important to cure in shocks or windrows so as to minimize their loss. Soy beans just beginning to pod make the most palatable hay. It becomes more nutritious, but coarser, as the plants develop toward maturity.



FIG. 688.—THE FIRST CROP OF SOY BEAN HAY GROWN BY A YOUNG FARMER ON POOR HILL LAND IN BROOME COUNTY, N. Y., 1914.

For Pasture

When soy beans are sown as for hay they may be pastured to advantage by hogs. This practice has been found to cheapen the pork production. The manure from the crop is left on the land ready for the succeeding crops.

For Seed and Grain

If it is desirable to grow a crop of seed or grain from soy beans, the seeding should be in rows from 28 to 35 inches apart to facilitate clean cultivation. Not more than a bushel of seed per acre will be required. The yields of seed range from 15 to 35 bushels per acre. Let the beanstalks stand until the leaves drop, and harvest with a reaper. Thresh when the pods are a little tough. The stored seed is liable to heat and be injured unless stored carefully.

For Soil Improvement

When properly inoculated with their own bacteria, soy beans are good nitrogen-gatherers. Inoculation of the seed with a pure culture from a laboratory, or the inoculation of the soil by the transfer of some from another soy bean field, are both practical. With seed inoculation the tubercles appear mainly around the tap-root. On relatively poor soils the bacteria increase the nitrogen content of the plant and also add to the nitrates available for succeeding crops.

COWPEAS

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Without doubt the cowpea is the most important legume grown in the states of the cotton belt of our country. It has been well said that what red clover is to the northern farmer, cowpeas are to the farmer in the south. It is the crop that can be depended on to maintain or even increase the productivity of all types of soil in the cotton-growing states. It can be grown as far north as southern New York, but it is doubtful if its profitable culture will ever extend much beyond the cotton-growing sections.

In its characters the cowpea is more like the garden bean than is the soy bean. The varieties most grown in this country belong to the species *Vigna unguiculata*, although other nearly related species have been brought into the country for trial. The cowpea is a tender summer annual with glossy, dark green leaves and rounded pods from five to eighteen inches in length. Some varieties are bushlike and others trailing in habit of growth, requiring some other plant to support them for best results; but none of them are true climbers like the pole beans of field and garden. The flowers are borne singly and are whitish, yellowish, or purplish in color. The seeds are either smooth or wrinkled, and commonly colored in shades of yellow, brown, and black. The "black-eyed" varieties have a ring around the scar of each seed.

HISTORY

Previous to 1907 the origin and history of the introduction of the cowpea into the United States was the subject of most diverse and erroneous beliefs. The facts were established by a searching investigation by the United States Department of Agriculture and the results published in Bulletin No. 102, Part IV, Bureau of Plant Industry (1907). It appears that the cowpea had its origin in the Afghanistan region of Asia, from whence it was distributed to China at a very early date, also to Arabia and Asia Minor at the beginning of the Christian era. It became known

in central Europe about the middle of the sixteenth century, and was introduced into the West Indies over two centuries ago, and from there to the American mainland, where its culture gradually extended northward until it attracted the attention of George Washington, then farmer on the Potomac.

The culture of the cowpea has greatly increased in recent years and this has increased the price of the seed, which in turn curtails the more extensive use of the crop. Cowpea seed for planting should be fresh, as seed more than one year old is likely to be of low vitality. Hard-seeded varieties have been found less subject to injury by wet weather at harvest time than are the soft-seeded varieties. The use of improved machinery for harvesting the seed crop is expected to increase the supply of seed and thus extend the area devoted to cowpea culture.

FEEDING VALUES

The cowpea is a nutritious fodder plant as well as a soil-improver. The following table of digestible nutrients per one hundred pounds should be compared with similar data for soy beans or other legumes:

	Total dry matter	Crude protein	Carbo- hydrates	Fat	Total digestible nutrients	Nutritive ratio
Cowpea seeds.....	88.4	19.4	54.5	1.1	76.4	1:2.9
Cowpea hay (in bloom).	89.4	12.6	34.6	1.3	50.1	1:3
Ripe cowpea hay.....	90.	6.9	42.1	1.0	51.2	1:6.4
Cowpea straw	91.5	3.4	39.1	.7	44.1	1:12
Green cowpeas and corn.	20.0	1.3	11.4	.3	13.4	1:7
Green cowpeas and sor- ghum	18.7	.7	10.0	.3	11.4	1:15.3
Green cowpea fodder....	16.3	2.3	8.0	.3	11.0	1:3.8

A study of these figures will show that cowpea seed is about equal to field peas in nutrients, and the hay made from both of these plants is similar in value. As green fodder, cowpeas are not equal to hairy vetch, and the mixture of cowpeas and sorghum is not equal to sweet corn fodder with the ears removed. Where field peas or red clover succeed well, there is little argument for growing cowpeas for the feed produced. In the South it is managed for fodder purposes in several ways.

COWPEA HAY

Five pecks of seed per acre sown through a grain drill gives a better crop and requires less seed than broadcasting. Good preparation before planting is more economical than intertillage in narrow rows, although a larger total yield may be secured in the latter way. The crop is cut down with a mowing machine and the vines wilted in the swath. Later they are raked into windrows, and if the weather is bad special devices are used to allow air circulation under and through the haycocks. From two to six days are required to cure the vines so that no moisture can be wrung from the stems by twisting. As with other legumes, the leaves are the most valuable part of the hay and should be preserved in the curing process.

The growing of cowpeas with Johnson grass, or with German millet, makes the curing process easier. Sorghum is also used to mix with the cowpeas, the Amber variety being recommended for this purpose. One-half bushel of sorghum seed with one bushel of cowpeas per acre are sown through a drill and the mixture harvested with a mower. The sorghum stalks make an excellent support for the cowpea vines.

FOR SILAGE

Cowpeas are grown with corn for silage in the northern part of the cowpea region. The cornstalks serve as supports for the vines and, when the mixed crop is harvested, enough of the ripe cowpea pods can be gathered to furnish seed for next year's planting. Pure cowpea silage is open to the same objection as that made against other legumes.

FOR SOIL IMPROVEMENT

By far the most important use for cowpeas is found in the increased fertility and improved mechanical condition that follow their culture. The cowpea acquires free nitrogen from the air by means of the bacteria, which cause the formation of the tubercles on its roots. Probably the most striking examples of tubercle growth and nitrogen-gathering propensity of any annual legume crop are found on the cowpea, where tubercles as large as the end of one's finger are often seen. The most valuable part of this

feature is that the plant will grow on and add nitrogen to sour, run-down soils, where clovers would' require lime and patience to show a benefit. The southern planter has in the cowpea a means of building up a profitable rotation of crops, if he makes correct use of the cowpea as a soil builder.

The most practical use made of the plant is where it is sown between the rows of corn at the last cultivation, and the vines turned under for manure for the succeeding crops in the rotation. Sometimes the cowpeas are pastured after the corn is harvested, but sheep and cattle are liable to bloat on this pasturage. In some sections a crop of cowpeas is grown between the harvest of wheat or oats in early summer, reseeding with grain in the autumn. Cotton, sugar cane, and wheat have all shown marked benefit from preceding crops of cowpeas. Especially do the crops of the grass family seem to profit by the increased store of available nitrogen following the culture of cowpeas.

COWPEAS FOR NEW YORK

Owing to the tenderness of cowpeas, their use in New York will always be restricted to the warmer parts of the state. On Long Island and in parts of the Hudson Valley they may be utilized as a catch crop for soil improvement on sandy land. They can never compete successfully with red clover or alfalfa for hay production, and it is doubtful if they will ever prove superior to soy beans for the live stock feeder. At the Ohio Agricultural Experiment Station, which is located in a climate similar to that of portions of New York, after a series of experiments Williams and Welton reported that "cowpeas are inferior to soy beans except possibly as a soil renovator on the poorer and more acid soils." It seems very likely that the statement will hold true for nearly all parts of New York.

VARIETIES

Of the few worth-while varieties of cowpeas, the New Era, Whippoorwill, and Iron seem to be the ones worth trying under New York conditions. The Iron variety has a valuable property in its resistance to the wilt disease and to root-knot caused by eel-worms. It is also vigorous, and quite erect in habit of growth.

SWEET CLOVER

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The acreage of sweet clover in the United States has increased very rapidly in recent years. The value of this plant as a soil improver, together with the fact that it will produce more pasturage from early spring until late fall than other legumes in the East, has been the principal cause for this increased acreage. Ordinarily, it does not produce so good a quality of hay as does red clover, but when carefully handled, hay of good quality may be secured. Experiments show that sweet clover compares favorably with red clover and alfalfa as a feed.

It is questionable whether the seeding of sweet clover is justified on land that will produce excellent stands of red clover or alfalfa. However, sweet clover may be profitably grown on soil that is too poor to grow clovers or alfalfa, and it is upon this type of land that the cultivation of sweet clover will prove most profitable.

Sweet clover is an excellent plant to precede alfalfa, as the large roots will do much toward breaking up and providing better aeration of the soil. Aside from adding much humus to the soil, it will serve as a medium for increasing the organisms that inoculate alfalfa.

Three species of sweet clover are grown under cultivation in the United States. However, only white sweet clover (*Melilotus alba*), shown in Fig. 689, should be cultivated in the East, as this species will produce a larger root growth, as illustrated in Fig. 690, and more forage than the biennial yellow species (*Melilotus officinalis*). White sweet clover seed demands a higher price on the market than seed of the yellow species. Annual yellow sweet clover (*Melilotus indica*), should be grown only in the extreme south and southwest.



FIG. 689.—WHITE SWEET CLOVER PLANT REPRESENTING THE AVERAGE GROWTH IN A FIELD 10 WEEKS AFTER SEEDING.

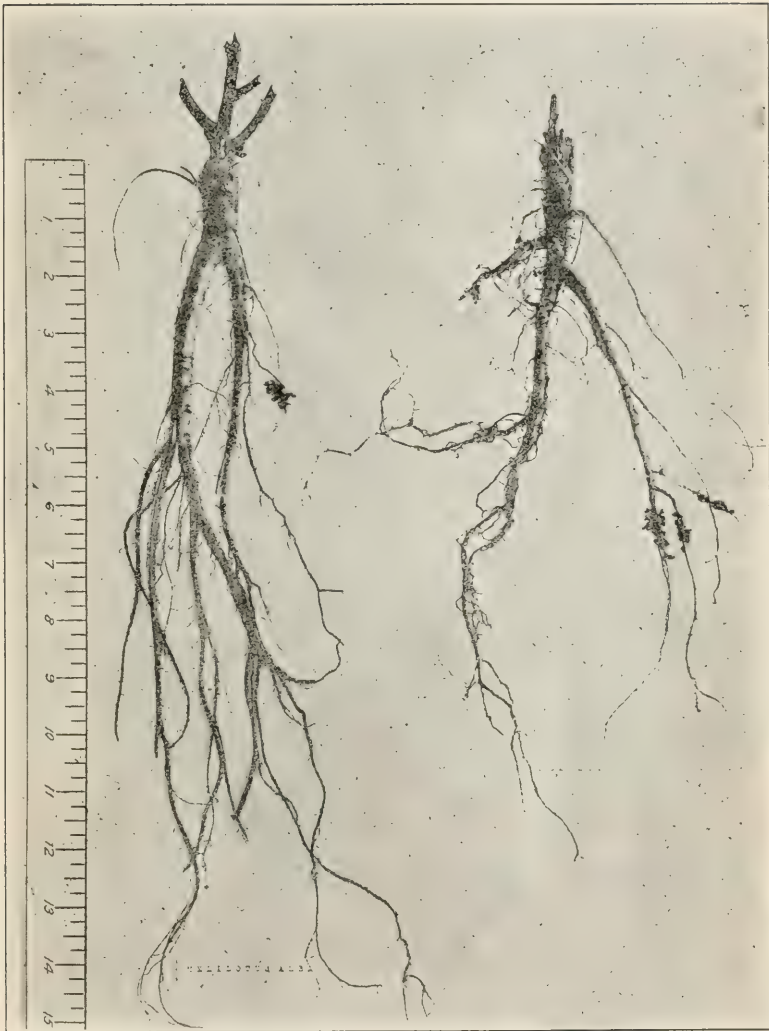


FIG. 690.—ROOT OF WHITE SWEET CLOVER (ON THE LEFT) AND OF BIENNIAL YELLOW SWEET CLOVER (ON THE RIGHT), COLLECTED 4 MONTHS AFTER DATE OF SEEDING. NODULES MAY BE SEEN ON THE RIGHT SIDE OF EACH ROOT.

SOILS ADAPTED TO SWEET CLOVER

Sweet clover has been grown successfully on all the principal soil types in the United States that were well drained, inoculated, and not acid. This plant prefers limestone soil, and it is upon this type of land that it grows so luxuriantly in some sections. Sweet clover appears to be well adapted to heavy clays, loams, and sandy soils. It is no more tolerant of poor drainage than is red clover, but it will withstand a higher water table than alfalfa.

LIME REQUIREMENTS OF SWEET CLOVER

It is essential to plant sweet clover on soil that is not acid (Fig. 691). Acid soil is one of the principal causes for so many failures with this crop in the East. When lime is applied to such soils, however, sweet clover will succeed on them. The effect of lime upon the growth of this plant has been studied in different sections of the country and the results thus far obtained show clearly that its lime requirement is as high as that of red clover. The yield of hay or the quality of pasturage produced is often more than double from an application of lime before seeding. The plants commonly make twice as much root growth in well-limed soils as in acid soils. This increase in root growth is very essential for soil improvement. Before planting sweet clover on acid soils an application of one ton of burned or caustic lime or two tons of finely ground limestone should be made to the acre.

PREPARATION OF THE SEED BED

The primary requisite for obtaining a stand of sweet clover is to have a firm, thoroughly compact seed bed with just enough loose soil on top to cover the seed. The lack of a firm seed bed is often the cause of a poor stand. When sweet clover is seeded in the spring on winter grain, the seed bed is usually in good condition. If it is seeded with spring grain, however, the seed bed should be rolled, preferably with a corrugated roller, after seeding. Better results are usually obtained when seeding is done in the spring on ground that has been plowed and thoroughly worked the previous fall.

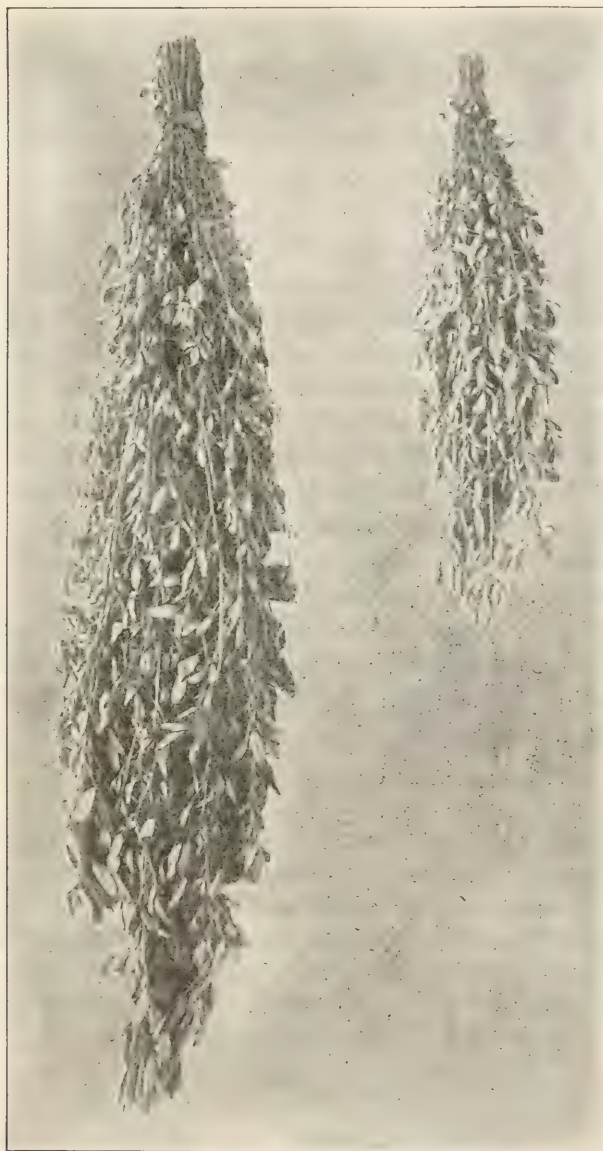


FIG. 691.—LIME HAS A MARKED EFFECT UPON THE GROWTH OF SWEET CLOVER. THE PORTION OF THE FIELD FROM WHICH THE PLANTS (TO THE RIGHT) WERE COLLECTED HAD RECEIVED AN APPLICATION OF ONE TON OF FINELY GROUND LIMESTONE TO THE ACRE A YEAR BEFORE SEEDING, WHILE THE SOIL ON THAT PART OF THE FIELD FROM WHICH THE PLANTS (ON THE LEFT) WERE COLLECTED WAS NOT LIMED AND WAS QUITE ACID.

INOCULATION

Sweet clover will not make a successful growth unless the plants are inoculated. Acid soils and lack of inoculation are the chief causes for so many failures with this crop. If the field where the seed is to be planted has not previously grown sweet clover or alfalfa, inoculation should be applied to either the soil or the seed. The field may be inoculated by broadcasting 300 to 400 pounds of inoculated soil to the acre. This soil should be obtained from a place where one of the above-named plants grows abundantly. As sunlight is very injurious to the inoculating germs, this soil should be scattered on a cloudy day or early in the morning or late in the evening and harrowed in immediately. Another method calls for the moistening of the seed and the sifting of one gallon of thoroughly inoculated soil over each bushel. When sweet clover is inoculated in this manner, the soil should be collected only from around the roots of well-inoculated plants. Seed treated in this way should never be subjected to sunlight, and it should be sown as soon as possible after treating. Inoculation may also be accomplished by using pure cultures of the inoculating organisms. These cultures may be obtained free of charge from the United States Department of Agriculture.

SEEDING

Hulled sweet clover should be sown in the spring. The seed may be broadcasted on honeycombed ground in the manner that red clover is often sown, or seeding may be delayed until the soil is sufficiently dry in order that the seed may be covered with a harrow or drilled. Better stands have been obtained from the latter method, and, whenever possible, it is recommended in preference to broadcasting the seed on honeycombed ground. The yield of grain will not be decreased by sowing the seed in this manner. Good stands may be obtained by seeding on winter grain or with spring grain. When sweet clover is sown in this manner, however, early-maturing varieties of grain are to be preferred and the grain should be sown at about two-thirds the usual rate for seeding in the vicinity in question. It is best not to sow hulled seed earlier than two weeks before the average date for the last severe freeze, as many of the seeds will germinate during the first few days of thawing weather and be killed by later freezes.

Only seed that germinates well should be sown. Most seed firms now sell scarified seed, 15 pounds of which, germinating at least 80 per cent, is sufficient to sow to the acre. When seed that germinates less is sown, the quantity should be increased in proportion to the germination. Unhulled seed is usually sown at the rate of 25 to 30 pounds to the acre. As this kind of seed contains a very large percentage of hard seed, it should be sown at least eight weeks earlier than seed that germinates well. This is necessary because it will require at least that much time for the alternating temperatures of late winter and early spring to soften the seed coats so that germination may take place.

USES OF SWEET CLOVER

Sweet clover was used as a feed for animals at least two thousand years ago, but until recent years its most important use was as a soil-improver. At the present time, in addition to being a valuable soil-improver, it is rapidly gaining in favor as a hay, pasture, and ensilage crop. Being a biennial plant it is well adapted to short rotations. It is especially valuable in all sections of the country as a honey plant, furnishing nectar for bees for a long period.

Sweet Clover as a Soil-improving Crop

Unlike many legumes, sweet clover will make a good growth on soils too depleted in humus for profitable crop production. In addition to its ability to grow and to produce a considerable quantity of forage on such soils, the large, deep roots will add vegetable matter to them. The extensive root systems do much toward breaking up the subsoils, thereby providing better aeration and drainage. Not only do the plants add organic matter to the soil, but in common with other legumes they have the power of fixing atmospheric nitrogen by means of the nitrogen-gathering bacteria in the nodules on their roots. The yields of the crops that follow sweet clover are usually increased materially.

Sweet clover is a very good winter cover crop to prevent soils from gullyng and washing. It also takes up much soluble plant food that would otherwise leach from the soil during the winter. The large taproots take up some potassium and phosphorus in the

subsoil and at least part of this is left in the surface soil when the roots decay.

Sweet Clover as a Pasture Crop

Sweet clover makes excellent pasture for horses, sheep, cattle, and hogs (Figure 692). Probably the easiest way to have stock acquire an appetite for this crop is to commence pasturing them on it when the plants are small. A sufficient number of animals should be kept in a sweet clover pasture to keep it grazed closely. This will prevent the stems from becoming large and woody and will also induce an abundant growth of young shoots. A good stand will usually provide sufficient pasturage for one mature steer or from 20 to 30 shoats to the acre. When pasturing upon this plant, stock make gains that compare favorably with those obtained on either rape or red clover. When pigs are turned on sweet clover, they should receive in addition to the pasture a daily grain ration of about two pounds of grain per hundred-weight of live stock. Sweet clover is more drought-resistant than alfalfa and will therefore produce considerable pasturage during midsummer droughts, as well as early in the spring and late in the fall.

There is but little danger of bloating when cattle or sheep are pasturing on sweet clover, but it is safest to avoid turning the stock into a clover pasture when it is wet with dew or rain or when the animals are unusually hungry.

Sweet Clover as a Hay Crop

If hay is desired, sweet clover should be cut when the plants have made no more than a 32-inch growth. At this time the leaves are most abundant and the stems have not yet become woody. If the crop is not cut until flower buds appear, the hay will be coarse and stemmy and the plants are likely to be killed. The principal difficulty in utilizing sweet clover for hay in humid regions is the fact that the succulent growth is difficult to cure into a good quality of hay, as it is necessary to cut it at a time when weather conditions are likely to be unfavorable. The hay should be raked into windrows just before the leaves begin to cure and immediately placed in cocks of such a size that they can be pitched on the wagon entire when cured. When the hay is cocked at this time, the

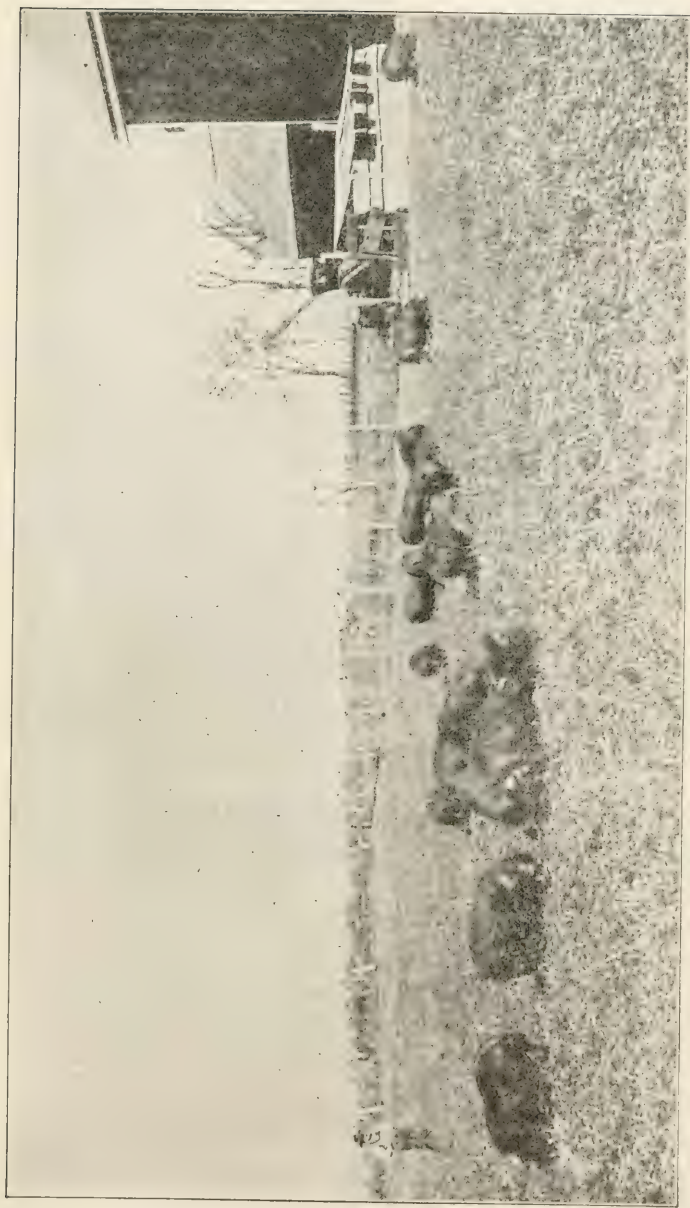


FIG. 692.—HOGS PASTURING ON WHITE SWEET CLOVER.

leaves will dry flat and turn water so well that it will seldom be necessary to open the cocks after rains. Sweet clover cures very slowly in the cock, but when cured the leaves are all intact.

The second crop the second season comes from the buds and young shoots left on the stubble instead of from the crowns of the plants, as is the case with alfalfa and red clover. If a second crop is to be expected, the plant should be cut sufficiently high so that one or two buds or young shoots will be left on each stub.

Sweet Clover as an Ensilage Crop

Sweet clover promises to become an important ensilage crop in some sections of the country. The first crop the second season may produce about half as much silage per acre as corn. In addition to this, the second crop may be cut for either hay or seed. When the plants are run into the silo, they should be cut preferably with a grain binder, as the bundles can be handled much more easily than loose plants. As the crop contains too much juice to be run into the silo immediately after cutting, it is well to permit the bundles to remain in the field until the plants are wilted thoroughly. Chemical analyses and feeding experiments indicate that sweet-clover silage is equal to corn silage as a feed. No difficulty has been experienced in getting stock to eat it.

Sweet Clover in Rotations

Since sweet clover is a biennial, it readily lends itself to short rotations. Seeded in the early spring, either alone or with a nurse crop, it produces its largest growth the following season and is ready either to turn under as a green-manure crop or to be utilized for pasture, hay, or ensilage. In many respects it is similar to red clover. This feature allows it to be used in short rotations with most farm crops. On many soils where red clover or alfalfa does not thrive sweet clover has proved to be an excellent substitute.

SEED PRODUCTION

In harvesting the seed it is important that the plants be cut when approximately three-fourths of the seed pods have turned brown to black. There will be some flowers and many immature

pods at this time, but the field will have a brownish cast. If the crop is not cut until the late blooms mature, a large percentage of the seed will be lost from shattering. The seed crop may be cut with a grain binder or a self-rake reaper.

When a grain binder is used, a tin or galvanized-iron pan the width of the elevators should be placed underneath the opening between the platform and lower elevator. A similar pan should be placed under the lower end of the binder deck. These pans, with the assistance of extensions to the elevator frame and binder deck and a guard placed at the lower end of the table, will save at least 90 per cent of the seed that would otherwise be lost from shattering. The extensions to the elevator frame and binder deck may be made of tin or galvanized iron and should be so wide that the plants will not extend beyond them. The shape of these extensions should be such that the seed which shatters and falls upon them will be directed into the pans. The guard at the lower end of the binder deck should be placed in such a position that the seed which shatters on the deck will be directed by it into the pan below. The front end of the pan below the opening between the platform and elevators should be protected so that the stubble will not strike it. The bundles should be placed in shocks immediately after cutting, but not capped. If the crop cannot be threshed within ten days after cutting, it should be stacked after being in the shock two or three days.

When the self-rake reaper is employed, the plants should be permitted to remain in the bunches as dropped by the machine until threshed.

The seed crop should be cut when the plants are damp from rain or dew so as to avoid as much shattering as possible. Only wagons with tight or covered platforms should be used for hauling the plants from the field to the threshing machine, as much seed will be lost from shattering if this is not done.

Sweet clover may be threshed with a grain separator or a large-sized clover huller. When a grain separator is used, the riddles should be adjusted, the speed of the fan reduced about one-half, and several rows of smooth concave teeth replaced by corrugated teeth.

ERADICATION

The failure of many farmers to make use of this valuable legume has been largely on account of the fear that sweet clover cannot be eradicated from their farms when once started. The biennial nature of the plant makes the problem of eradication very easy. The plant does not give trouble in clean-cultivated or inter-tilled crops, as the cultivation readily kills young plants. Its appearance in meadows or grain fields should give no alarm, as mowing will serve to kill the sweet clover. This crop is seeded annually on thousands of acres of land in many sections of the country, and not a single case has been noted where it has become aggressive, with the possible exception of irrigated land in the West. In this region it becomes a pest at times along irrigation ditches.

TEOSINTE

The following article by W. J. Spillman is taken from Bailey's *Cyclopedia of American Agriculture*, Vol. II, published by The Macmillan Company.

This is an annual forage plant closely related botanically to corn. The appearances and inflorescence are much like corn, but no true ear is formed; the seed is produced on slender spikes in four or five leaf-axils near the center of the plant. A tassel is borne similar to that of corn. Some botanists hold it to be the original form of corn, with which it readily crosses. It is a rank grower, reaching a height of nine to fifteen feet, and bearing an abundance of leaves and slender stems. Thirty to sixty stalks are sometimes sent up from a single root. Some of the suckers attain nearly the same size as the main stem and mature at about the same time. Under favorable conditions, growth continues until checked by frost.

DISTRIBUTION

The successful growing of teosinte is restricted by soil and climatic conditions. It demands a rich soil with an abundance of moisture and a long, hot growing season. Where these conditions do not prevail, it is easily superceded by sorghum, corn, and other forage crops. The plant is a native of the warm parts of Mexico and Central and South America, though it was first cultivated in Australia. In the United States its best growth is made along the Gulf coast, in Florida and Louisiana, and in Georgia and Mississippi. It may be grown as far north as New Jersey and Kansas, though in the northern states it can scarcely be considered an economic forage plant. It has been grown with some success in Michigan and southern Oregon. In New York and Vermont it has not given satisfaction. * * *

CULTURE

The planting season is May or June, and it should not be delayed beyond this because of the long growing season required. Rich bottom land or any soil that will produce good crops of

corn is most desirable. The drills should be three to four feet apart, the plants one foot apart in the row. It is sometimes advised to make the drills five feet apart and the hills three feet apart in the row, three or four seeds being planted in each hill. The richer the land the farther apart should the seeds be planted. One to three pounds of seed per acre is used, depending on the method of planting; usually one pound per acre is sufficient. The seed is rather expensive, and must be purchased each year.

The crop is given much the same cultivation as corn, and is fertilized as for corn or sorghum.

HARVESTING AND YIELD

Teosinte is seldom used in any way except as a soiling crop. Its great succulence and the fact that it is usually grown where there is much rain renders it nearly impossible to cure it for fodder. It has occasionally been ensiled and is said to make a fair quality of silage. When used as a soiling crop, it furnishes several cuttings during the season. It is best cut when four or five feet high, as it becomes less palatable if allowed to mature much beyond this. When grown for fodder it may be cut late in the season, and the amount of feed secured will be practically as great as that secured by cutting it several times during the season.

Although teosinte has been known for a long time, it has almost no standing as a farm crop in this country. It is utterly useless to plant it on any except moist, rich soil, and such soil is not common in the section where it is grown. The fact that practically its sole use is for soiling purposes greatly limits its usefulness as a farm crop.

Literature. Farmers' Bulletin No. 102, United States Department of Agriculture; Kansas Experiment Station, Bulletin No. 123; Florida Experiment Station, Bulletin No. 78.

SPELT

This is an ancient form of wheat which has been cultivated for centuries in Europe and Africa. It grows to about the usual height of wheat. An examination of the spike will show the reason why it is distinct from it. The spikelets do not break off the rachis and leave a zigzag-shaped terminal to the stalk as in ordinary wheat, but they hold together and, in separating, a part is broken off and remains attached to the spikelet. The weight is about 40 pounds to a bushel. Emmer is often confused with spelt and is not easily distinguished. The stems are pithy, and the leaves are covered with velvety hairs. The heads are flattened, two-rowed, and bearded. (Extracts from Bailey's Encyclopedia.)

It is a compromise between wheat and barley, less valuable than either. It is difficult to thresh and contains a good deal of hull or fiber. It is adapted to the semiarid regions. Spelt has no place in New York's agriculture as spring grain. One would better grow oats, barley, or spring wheat. It is given a place in this bulletin because, during the past year, its use has been advocated by unscrupulous men as a new plant with wonderful properties.

PASTURES IN NEW YORK

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The supremacy of New York as a hay-producing state has never been questioned, and it follows, as a natural corollary, that her pasture lands should be noteworthy in extent and quality. The first part of this proposition is easily demonstrated; the latter is much more difficult of proof and its discussion will be the principal purpose of this paper.

The total improved land in the farms of this state, according to the Thirteenth Census, was 14,844,039 acres; the combined acreage of all crops reported was 8,387,731; leaving a difference of 6,456,308 acres, or 43.5 per cent, in pastures, orchards, and vineyards. Making a generous allowance for the two last mentioned would still leave the acreage of pasture lands at least equal to its nearest competitor, the hay and forage crops occupying 5,043,373 acres. In addition there is a vast but undetermined acreage of unimproved land in the state whose chief economic use is as pasturage.

QUALITY OF PASTURE

As New York lands in general are naturally adapted to the production of hay of good quality, yield, and permanence, the same superiority should hold for pasturage, which it surely did within the memory of many of our present-day dairymen and stockmen. But few, if any, will deny that present-day pastures are not to be compared with those of three or four decades ago, when the purchase of mill by-products was practically unknown and when the dairy herds maintained a satisfactory milk flow from early spring till late fall on pasturage alone.

It is a sad but unassailable fact that many of these splendid natural pastures have been so abused through the practices of pioneer agriculture that their economic use is limited to from four to six weeks, during the rest of the season furnishing little

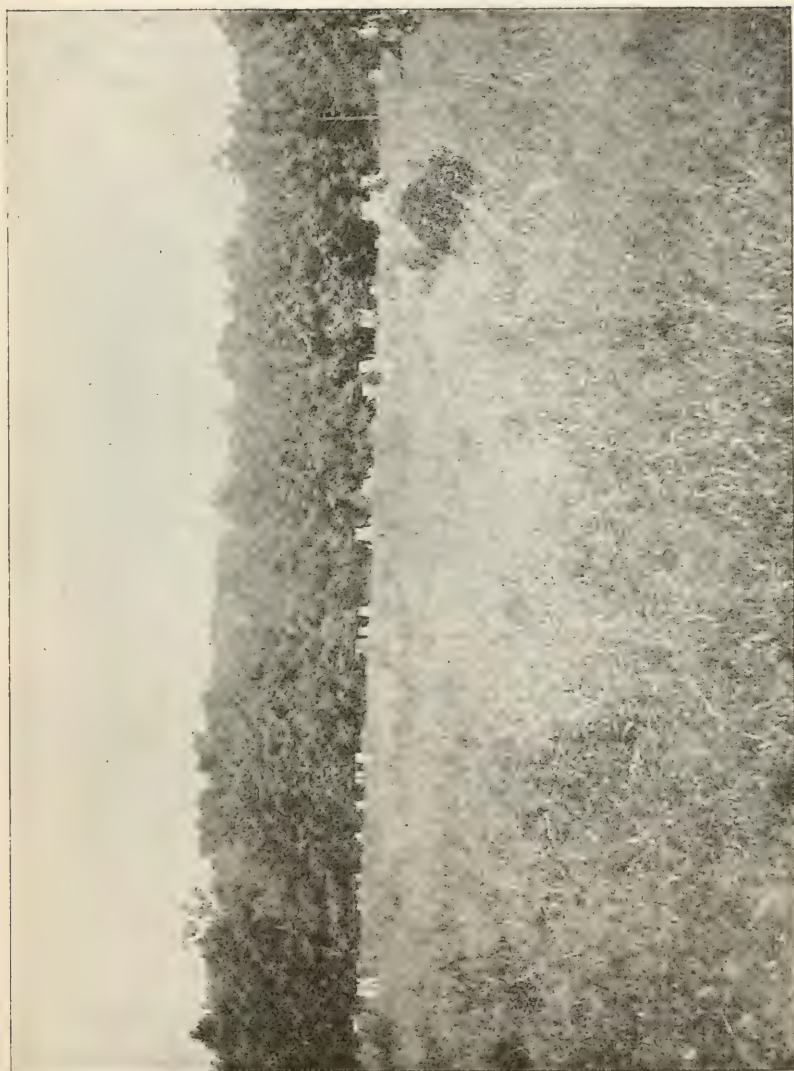


FIG. 693.—TYPE OF LEVEL UPLAND PASTURE IN WESTERN NEW YORK. NEEDS DRAINAGE BADLY. ABOUT TWO-THIRDS SAWAMP GRASSES, ONE-THIRD BLUE GRASS AND WHITE CLOVER. NOTE THE WHITE PINE STUMPS OF THE ORIGINAL FOREST AND THE SECOND GROWTH OF SUGAR-MAPLE IN BACK-GROUND. THIS PASTURE WILL BE CLEARED, PLOWED AND RE-SEEDED TO PERMANENT PASTURE UNDER DIRECTION OF THE LOCAL FARM BUREAU.

more than exercise room and shade for the farm animals. There are several important reasons for this rapid decline, which are worthy of discussion.

Probably the chief cause of deterioration is the same that has so seriously affected all agriculture in the humid sections — the removal of the forests that so effectually controlled the run-off of the rainfall and distribution of the moisture.

Next in importance, and in some respects an effect of the first, is the loss of humus and consequent development of undrained areas where the nutritious grasses have been driven out and replaced by the coarser and less nutritious water-loving species. This is particularly true of a large area of the shale soils in southern and western New York, where expensive underdrainage will be required to insure complete restoration. Present value of pasture lands will hardly warrant this expense.

Another contributing factor was the opening of vast tracts of cheap western lands, increasing competition and lowering prices. In the face of this the eastern stockmen dropped the beef cattle industry and turned their attention almost entirely to dairying. As profits dwindled they attempted to stay the tide of their fortunes by putting on more cattle instead of better, turning the cattle out earlier in the spring and keeping them at pasture later in the fall. This overstocking and overpasturing could have but one effect. The valuable grasses were killed out by close cropping and coarser weeds immediately took their places. It is a pleasure to say that within the last few years a strong tide of reaction has set in and that throughout the state a big movement is under way for better cattle rather than more in number. The encouraging fact of the situation is that pasture reclamation and improvement are entirely feasible wherever good pasture has previously existed.

CLASSES OF PASTURE

Broadly speaking, the pasture lands may be naturally divided in four distinct classes:

First, woodland in which farm animals are turned to gather what scanty herbage they are able. This is hardly worthy of the name of pasture and is a practice which should be discouraged for the benefit of the trees. The Forestry Department is doing a good educational work along this line.

Second, cleared or partially cleared lands that are too brushy, stony, steep, or otherwise unsuited to cultivation. This class includes many small areas near the farm buildings, used as night pastures for the dairy herds. A large proportion of the total acreage is without doubt in this class.

The third class is most hopeful of all, being those lands which are entirely capable of cultivation, but left in pasturage because



FIG. 694.—WOODLAND WITH A SCANT FRINGE OF CLEARED LAND AROUND IT. HERBAGE IS LARGELY SMARTWEED AND THE CATTLE FIND MOST OF THEIR COMFORT AT THE WATER-TROUGH.

of their natural adaptation to permanent stands of grass or because so required by the economical management of the farm. This character of land has played an important part in the dairy supremacy of the Empire State.

The fourth class is of limited extent and hardly worthy of the name, although furnishing a fine quality of feed. It includes the lands in regular crop rotation, which are pastured one or two

seasons in the course of rotation. There is room for argument as to whether or not this is in each case a desirable practice. Most of this class occurs in those sections where there is little waste land and where values are high.

PASTURE IMPROVEMENT

The first class mentioned may be immediately dismissed from discussion under this head, because woodlands are more profitable for timber production and the pasturage they furnish is of little account in economically maintaining farm animals. On the other hand, a little shade in any pasture is grateful to the animals in the heat of midsummer. The essentials of good pasturage might be stated — succulent, nourishing feed through the season; abundant, pure water supply easily accessible; and sufficient shade. The importance of the last is apparent when we reflect that the ruminant spends only as long as necessary to gather sufficient food and then needs a comfortable place to complete its mastication. This fact explains the poor results from pastures of large area with scant herbage and those too steep or rough to be easily travelled.

Except to suggest the wisdom of an addition of pasture grasses to the clover and timothy sown, the fourth class needs no discussion under the head of improvement, as lands in regular rotation are usually in a good state of production and the pasturage is only to conserve some part of the grass crop or because there is no other available area on the particular farm.

That leaves us the two larger and more important classes of pasture land requiring improvement.

PASTURE LANDS UNSUITED TO CULTIVATION

Our definition of the second class, "cleared or partially cleared lands which are too brushy, stony, steep, or otherwise unsuited to cultivation," immediately precludes the most important means of reclamation we have — reseeding. What then remains to be done for this important division? Much that is cheap and practical, even for the man of limited capital.

Many an otherwise good pasture has been allowed to grow up with thorns and brush till half or more of its area is occupied to

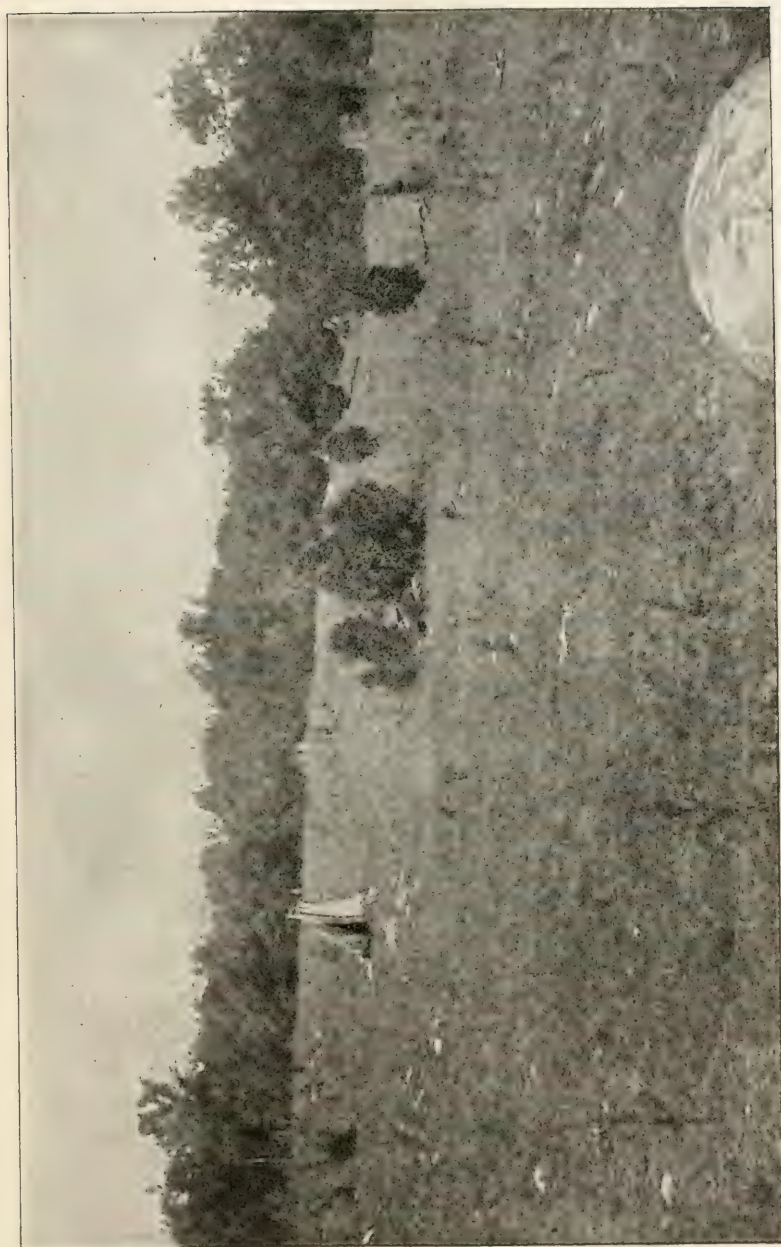


FIG. 695.—ROLLING PASTURE RATHER STONY FOR CULTIVATION. GOOD SOD OF BLUE GRASS AND CLOVER FROM NATURAL SEEDING. SEVERELY OVERSTOCKED. NEEDS SOME CLEARING AND TOP-SEEDING WITHOUT PLOWING.

the exclusion of grass. There are many seasons of the year when teams and men are not otherwise profitably employed and when they might be used to good advantage jerking out this foul growth. Stony areas are not so susceptible to easy improvement. There are many in the state unprofitably used for dairy cattle that might give better returns through sheep. Many should never have been cleared at all, and now that the damage has been done it might pay to investigate the possibilities of reforestation. There are many pastures in this class where plowing might be hopeless, yet having considerable open spaces where some tillage implements may be used. Such offer considerable opportunity for partial re-seeding without breaking up the old sod. Such work is still in its infancy in this state and it is unwise to assume to speak authoritatively about it. However, enough results have been secured to offer considerable encouragement to the practice. The first controlling factor is the proper season and the best that may be said is "probably some time in May." Soil requirements are among the first things to consider and very generally throughout the state lime, humus, and phosphoric acid will need replenishing.

Lime is to be had at a cost of not over three or four dollars per ton for ground limestone and should generally be used at the rate of at least one ton per acre to insure results, depending, of course, upon the needs of the particular soil. Humus is hard to supply to this class of land except from the droppings of the animals or in some cases by direct distribution, where there is an excess supply of manure. Best results so far have usually come from supplying phosphoric acid in the more soluble forms, as acid phosphate, at the rate of from 200 to 400 pounds per acre. It might be well to state that the lime and acid phosphate should not be mixed. The lime might properly be spread first and worked in with any implement that could be used, as an old disk or spring-tooth harrow. Where neither of these may be used, an old A-drag is serviceable, even when wooden teeth have to be used and replaced when broken. The old turf, or what remains of it, must be partially broken up in some way before results can be confidently expected with any top-seeding.*

* An instance has recently come to my notice of a pasture in St. Lawrence County, which was infested with paintbrush. This was so treated, and the next year clover overspread the ground.—Compiler.

PASTURE MIXTURES

Most of the early failures with pasture seeding may be blamed directly on poor choice of seeding mixtures. Grasses that are commonly suited to meadow mixtures are entirely unsuited to pasture work. They do not make a firm, even turf that will withstand trampling, nor are they sufficiently permanent. However, they are of use as a part of the pasture mixture. Blue grass of either the Kentucky or the Canada variety forms the basis of most permanent pasture mixtures. The Kentucky variety is best suited to moist lands; for, while it is true that it forms a smooth, tough sod, starts growth early, and furnishes nutritious feed for a long season, it cannot withstand severe drought. On dry lands the Canada variety should have the preference. Kentucky blue grass is identical with the so-called June grass that grows naturally in many sections of the state. The Canada variety may be easily identified by its zigzag stem. A little white clover is always desirable in the mixture. Though it furnishes no great amount of feed, it is highly relished by all stock; it withstands drought and trampling and is very serviceable in making a smooth, firm turf.

It would be indeed presumptuous to attempt to quote a "one best" mixture for all lands and conditions. The grass mixture may very properly be varied to suit local conditions. There are many both good and poor ones on the market. In general, it is advisable to buy the best quality of tested seed of the separate varieties you wish and mix them yourself. There are certain qualities common to all good mixtures that may best be illustrated by quoting two good ones that have stood the test in many parts of the state and are widely used in the extension teaching and demonstration work being carried on by our agricultural institutions, as follows:

FOR MOIST LAND		FOR DRY LAND	
Grasses Used	Number of pounds	Grasses Used	Number of pounds
Timothy	5	Timothy	5
Redtop	5	Canada Blue Grass.....	5
Orchard Grass.....	5	Orchard Grass	5
Meadow Fescue.....	5	Awnless Brome Grass.....	5
Kentucky Blue Grass.....	5	Alsike Clover	5
Alsike Clover	4	White Clover	1
White Clover.....	1		

Timothy is used in both for quick results; the choice of blue grass depends on the character of the soil; orchard grass may be objected to by many, but it gives good early and very late feed, and in such a mixture does not tend to grow in such undesirable clumps as in a thin seeding. Redtop and meadow fescue are good grasses under moist conditions, although of little use on dry land. On the other hand, awnless brome, which is in great favor in the semiarid West, is proving of high value on the drier lands of the state, where it outyields and outranks timothy. Alsike and a little white clover is of almost universal use. The amount of seed used per acre will not need much variation, from the totals given in the table; evenness of distribution is of more importance. Broadcasting by hand is almost essential where orchard grass has a place in the mixture, as few seeding machines are capable of handling it.

PASTURE LANDS CAPABLE OF CULTIVATION

The third class of pasture lands — those entirely capable of cultivation — should be handled much the same as for meadow seeding, with the exception of the mixture used, bearing in mind, however, that the seeding is for a long-time stand and the preparation and fertilization therefore must be fine and thorough. The rate of seeding of the nurse crop, whether it be rye, wheat, or barley, should be much less than for a full crop of grain, to avoid robbing the grass seeding of needed moisture at a critical time.

Many failures are recorded from undue haste in using a newly-seeded pasture. It takes time to produce a full, firm sod, and great caution must be used in not pasturing too early nor too heavily.

CARE

Weeds are the great enemy of pasture lands. Where good seeding and fertilization have been practiced, they can scarcely obtain a foothold, but are ever ready to occupy any space where for any reason the tame grasses have been killed. Reseeding is the best remedy, where possible, but on the rough lands there is little to be done beyond preventing, as far as possible by clipping, the weeds from going to seed. Chemical applications, such as salt, are of doubtful value and are of considerable expense.

One of the best and cheapest methods of pasture renovation is that commonly called rotation. A very general practice is to turn all the animals on all of the pasture land at once and before it has obtained sufficient growth in the spring. The animals proceed to devour every green blade, keeping all growth down except rank weeds. There is no surer way known of killing plants, as without leaves they have no way of making starch.



FIG. 696.—TYPICAL ROUGH HILLSIDE PASTURE INFESTED WITH THORNS AND POPLARS. FULL OF "CRADLE KNOOLS" COVERED WITH MOSS AND HERBAGE BURNED TO A CRISP FROM ITS SOUTHWEST EXPOSURE.

The simple and reasonable remedy is to divide the pasture area into feed lots by suitable fences and allow the animals access to one lot at a time for a period dependent on the land and the season, giving each lot time to make sufficient growth to perpetuate itself. Results from this simple procedure have often been marvelous, weed growth diminishing and desirable grasses reseeding themselves, all for the cost of a little extra fencing and attention to nature.

On the whole, the outlook for pasture improvement is very promising, as so many are vitally interested, while the causes of failure are so apparent and the opportunity for help from our agricultural institutions along this line so good. Yet there are many who most need help that have not yet heard the call for "preparedness" in pasture improvement, the most extensive farm interest in the greatest grass-producing state — New York.

FITTING AND PUTTING DOWN LAND TO PERMANENT PASTURES AND PASTURE GRASS MIXTURES

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GENERAL CONSIDERATIONS



In New York State there are approximately thirty millions of acres. The United States Census shows that about one-half of this area is improved and the other half is unimproved. Referring to the unimproved area, it appears that there are ten millions of acres occupied by forests, three millions by pasture, and two millions of acres are waste land. Studying the improved area in the same way, it is found that there are seven million

acres of pasture, five million acres of hay and forage, and three million acres of other crops.

Without stopping to analyze the agricultural significance of these figures in detail, it is evident that, so far as area is concerned, pasture is more important in New York than any other crop or group of crops except forests. On the other hand, these pastures are almost universally poor. They are nonproductive. They are weedy. They have a poor stand of grass or none at all. They are often overgrazed and otherwise abused. For the most part, they have received little or no intelligent care. Perhaps the very fact that the area involved is so large accounts in part for the present condition.

Before any study of means of improvement is made, it must be borne in mind that many so-called pastures cannot be improved. The cost in some cases would be prohibitive. In many other cases the location could not be made to grow grass, presenting a problem for the forester rather than the crop farmer.

TILLAGE

When preparing to seed land to pasture, thorough tillage is just as important as in growing any other crop. Therefore, whenever possible, pasture areas that have become poor and are to be reseeded should be given cultivation. In many cases corn or potatoes are grown the first year after the old pasture is broken, grass seed being sowed the following season with oats. In other cases, buckwheat is grown the first year and then followed by some other crop with which seeding is done. In still others, the land is fall- or spring-plowed, worked during the summer, and seeded in August or September without a nurse crop, as is sometimes done by the best hay growers.



FIG. 697.—AN IMPROVED PASTURE IN EARLY JUNE. RESULT OF SMALL AMOUNT OF CULTIVATION, LIME AND A PROPER MIXTURE.

Of course, it must be borne in mind that there are many pastures on which procedure such as is outlined above would not be practicable. Some of the fields can be quite thoroughly broken by passing over them several times with a disk or spring-tooth harrow. On some no tillage can be practiced.

FERTILIZER

Extensive observation shows that, so far as fertilizers are concerned, most pastures need lime and phosphorus. When seeding can be done on a well-tilled field with oats or some such nurse crop, it is wise to use 2,000 pounds or more of ground limestone or its equivalent per acre, together with 200 to 400 pounds of acid phosphate. Where thorough tillage cannot be practiced, there is more of a question as to what to do in regard to the application of plant foods. Lime should usually be employed and applications of phosphorus may also pay. In such cases, it is advisable to make a trial on a few limited areas first to determine what the effects are, using the knowledge thus obtained on which to base future practice. In many cases where there is a fair stand of pasture grass, and weeds are not too thick — pasture being poor because of a lack of vigor of the stand — top-dressings of lime, also acid phosphate, prove very beneficial. Stable manure can be used with most excellent results in establishing new pastures, in maintaining them, and in rejuvenating old ones; but it is questionable if under usual circumstances it is permissible to remove it from the regular rotation. It is very true, however, that old pastures having a reasonably good stand of grass can be made to yield abundantly for some time by small applications of it.

SEEDING MIXTURES

Many pastures in New York are poor because they have never been seeded with a pasture mixture. When the land was cleared and put out to pasture or when it was used for pasture after having been cropped for a time and seeded for meadow, it was assumed that grasses suitable for pasture would grow naturally in sufficient abundance and variety. In some cases the assumption worked out; in many others it did not. Because of this condition there is but little attempt made on the part of most farmers to utilize pasture mixtures. In the past, such pastures as there were have existed without them; also, there is very little knowledge on the part of the rank and file in regard to the habits, uses, and values of the different plants that can be utilized for the purpose of

pasture improvement. The limits of this article do not permit a discussion of the characteristics of the plants that may be used. Suffice it here to say that if pastures of any degree of permanency and of the greatest value are to be secured, more plants than timothy and clover must be used.

In planning pasture mixtures, the character of the land is a factor of great importance. Of necessity, it will greatly influence our selection of species. Some pasture plants grow well in wet land; some, in dry land; and so on. A good pasture will start early in the spring, grow continuously during the season, and continue to grow until late in the fall. It will make a



FIG. 698.—WELL CARED-FOR PASTURE SUSTAINING A LARGE NUMBER OF STOCK.

thick, even growth. These are some things to be aimed for in pasture improvement, and more can be done toward attaining the object in view by properly compounding the mixture than by any other one thing. A great amount of effort is largely wasted in attempting to improve pastures, because good seeding mixtures are not used. Pastures improved without good seeding mixtures may do well for a year or two and then begin to retrograde; whereas, if the mixture and other conditions are right, good results should be obtained for a considerable period of years.

For good land, that is, land which with fair treatment would grow corn, the following mixture will usually prove satisfactory :

	Pounds per acre
Timothy	10
Kentucky blue grass	4
Meadow fescue	4
Orchard grass	4
Red clover	6
Alsike clover	3
White clover	1-2

If the good land be wet, redtop should be added or substituted for all or part of the orchard grass and meadow fescue.

For poor land, or land that is quite sour and on which sorrel and paint brush grow freely, or on poor wet land, the following mixture will probably give good results :

	Pounds per acre
Timothy	10
Redtop	4
Canada blue	4
Red clover	2-6

(A small quantity in unfavorable conditions and more in favorable conditions.)

Alsike clover 2-5

(Where the small quantity of red clover is used, employ the large quantity of alsike, and vice versa.)

White clover 1

The above mixtures are merely suggestions. Many others suited to many conditions could be presented, but those given above illustrate the principles involved.

On very dry land, awnless brome grass and tall oat grass are of considerable value. In many situations sweet clover can be sowed to advantage with the above combination, but in planting it one must bear in mind that it needs lime in abundance for its successful growth.

These mixtures may be used, not only where seeding is done with a nurse crop, but also on areas that are merely harrowed

or where tillage may not be practicable. Many poor rough pastures can be improved by the persistent sowing of pasture grasses spring after spring, while the ground is open with frost. In such practice, only a small quantity of seed per acre should be used. If one can not use so much, considerable can be done by sowing four pounds of orchard grass per acre, two or three springs in succession. Wet pastures and quite swampy areas can be improved in the same way by sowing red top, about four pounds per acre. Usually, however, better results can be obtained by sowing a suitable mixture than by sowing a single species.



FIG. 699.—SWEET CLOVER IN PASTURE. CATTLE LIKE IT AND IT STANDS GRAZING WELL. DOES WELL ON SOME SOILS. PHOTO TAKEN IN SEPTEMBER.

GENERAL MANAGEMENT

One way to kill weeds is to keep them from showing green leaves. In fact, any plant — wild or cultivated — can be destroyed if its leaves are persistently destroyed. Many pastures are so managed that they show green leaves but a very short interval at a time. They are grazed too early in the spring, too late in the fall, and too continuously during the summer. If the permanent pasture area on each farm could be in two or three fields rather than in one block, and the animals changed from field to field regularly at intervals of ten days to three weeks, much

could be accomplished. Weeds and unconsumed grass can be mowed to advantage. Harrowing pastures at intervals is a practice that is often very beneficial, as it breaks the sod and scatters the droppings of the animals. Poor spots may be fertilized, harrowed, and reseeded.



FIG. 700.—SECTIONS OF PERMANENT PASTURE.

SUMMARY

The large pasture area of New York is in poor condition, first, because it was not prepared especially for pasture purposes, reliance being almost entirely placed on natural agencies to make good grazing land; and, second, because it has been neglected. Observation and experience show that intelligent effort directed to our pasture fields will give results. Pastures need tillage. They respond to intelligent fertilization. Pasture mixtures are important in seeding. By using the proper combination, more feed can be obtained throughout the season and plants suited to the particular situation can be introduced. The general management of the pastures must be so planned that the grass plants have a fair show. Attention to a few details will be fully repaid in the results that accrue.

FOLLOW-UP WORK ON GRASS SEEDS

In a number of counties where farm bureaus have not yet been established, D. P. Witter, one of the lecturers in the Bureau of Farmers' Institutes, did considerable follow-up work during the summer of 1916 in aiding farmers to carry out the teachings of the institutes. Some of the interesting results of this work on grass lands are given in the following paragraphs:

On the farm of P. J. Taylor of Owego, eleven acres of alfalfa were started in 1915, on gravelly land having a deep, open subsoil. Care was exercised in the preparation of the soil before seeding, and the land was limed and an application of acid fertilizer given. Inoculation was accomplished both by application of soil and by cultures on the seed. The land was badly washed on several occasions during the time of preparation, and when the seed was sowed, it was not in the best condition. Plant food was abundant and inoculation excellent, however, and the total yield of hay for two cuttings has been more than thirty-six tons on eleven acres. The third cutting will bring the average yield for each cutting up to more than four tons an acre, a creditable record for the first year.

Another experiment productive of interesting results is being conducted on the celebrated stock farm of Stephen Sanford and Sons, Amsterdam, New York, where in 1915 a five-eighths-acre plat was planted to pedigreed timothy on land that had grown carrots the preceding year. Previous to planting, repeated harrowing was practiced, and the seed bed was put in good condition. Acid phosphate was applied at the rate of 200 pounds to the acre. The seed was sown with a garden seeder in drills thirty inches apart. Although heavy rains injured portions of the plat, the results on the whole have been very satisfactory. The heads range from four to eight or more inches in length, and the plants grow five feet in height and are very leafy. This plat is being maintained for seed.

A thirty-acre pasture on the same farm, located within the race track, is shown in Fig. 702. This photograph was taken July 24, 1916, and it was then being grazed by brood mares, although it

had been mowed, and a heavy crop of hay had been removed about July 1. The mixture used for seeding each acre was as follows:

	Pounds
Red clover	4
Alsike clover	3
White clover	2
Timothy	8
Redtop	5
Kentucky blue	5
Orchard grass	2



FIG. 701.—PEDIGREED TIMOTHY, PARENT NUMBER 1630, GROWING ON "HURICANA" FARM, OWNED BY STEPHEN SANFORD AND SONS, AMSTERDAM, N. Y. THIS STRAIN OF TIMOTHY GROWING AT CORNELL UNIVERSITY, IN 1911, YIELDED 3,350 POUNDS OF HAY AN ACRE MORE THAN THE YIELD OF BEST RECLEANED SEED PRODUCED. ESTIMATED. PHOTOGRAPHED JULY 24, 1916.

Although instructions were given for only two pounds of orchard grass, a much larger amount was sown. Except for this excess, however, the land is well covered with good grasses.

A sixty-acre pasture on the Sanford farm, which in 1914 was well seeded with devil's paintbrush and wild strawberry, shows much improvement for land that has not been plowed. At that time it was a question as to whether it were worth while to attempt to improve this land without plowing, but since the



FIG. 702.—THIRTY ACRE PASTURE ON "HURICANA" FARM, OWNED BY STEPHEN SANFORD AND SONS, AMSTERDAM, N. Y. SEEDED WITH OATS, MOWED TWO YEARS, THEN PASTURED. PHOTOGRAPH TAKEN JULY 24, 1916.

pasture could not be spared the attempt was made. In May, 1915, after about eight loads of manure had been applied to each acre, the land was limed at the rate of 3,200 pounds of raw ground stone an acre. The following seed mixture was then sown:

	Pounds
Red Clover	2
Alsike clover	11½
White clover	1
Timothy	4
Redtop	2
Kentucky blue	2
Orchard grass	1

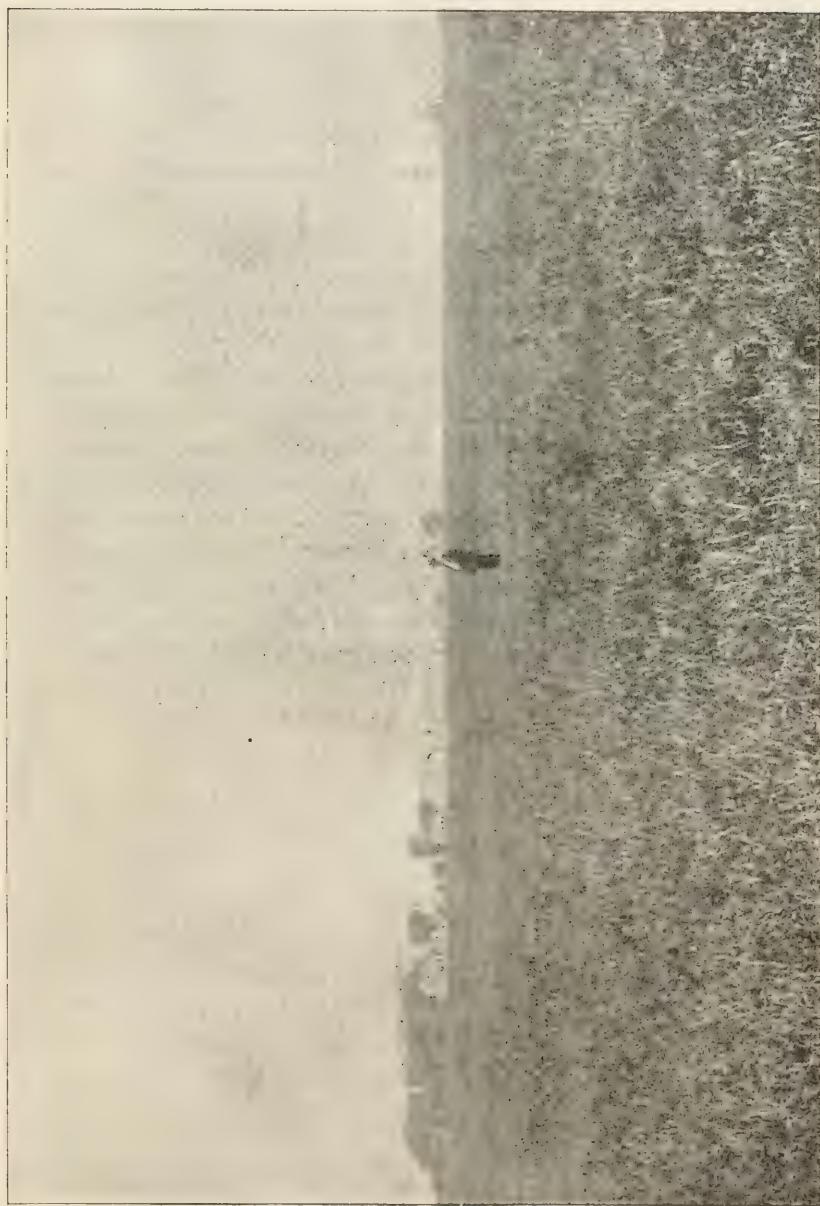


FIG. 703.—SIXTY-ACRE PASTURE ON "HURICANA" FARM, OWNED BY STEPHEN SANTORD AND SONS, AMSTERDAM, N. Y. IMPROVED WITHOUT PLOWING. PHOTOGRAPHED JULY 24, 1916.

Harrowing was practiced in either direction with smoothing harrows, and the land was then rolled. In order to give the young plants a start, no stock was allowed in the pasture for about one month. At the time the work was done, the weather was very dry, but rains soon came and with them a good stand of young plants. Late in June, 1915, and again in June, 1916, the pasture was mowed, and in the thickest spots the hay was removed.

The photograph shown in Fig. 703 was taken July 24, 1916, after several brood mares had been grazing it, yet the white clover in blossom was abundant, and a good supply of all grasses sown was to be found standing from six to ten inches high. On the same day eighty two-year-old steers were turned in for grazing.

It is safe to say that there was more than four times as much grass on this land, July 24, 1916, as could have been found before the work of improvement was undertaken. Such practical enterprises lead us to conjecture what vast possibilities lie within the power of New York farmers, if they will but exercise a little more thought and a little more care in making their farms more productive. A more self-sustaining agriculture is the watchword of New York State today, and from no source are we likely to obtain quicker and more attractive returns than from attention to our pastures.

BUTTER AND CHEESE FACTORIES, MILK STATIONS AND CONDENSING PLANTS IN NEW YORK STATE

Key to Abbreviations

B	= Butter Factory.	M. S	= Milk Station.
C.	= Cheese Factory.	Cond.	= Condensing Plant.
B & C.	= Butter and Cheese Factory	Sk. Sta.	= Skimming Station.
M., B. & C. = Milk, Butter and Cheese			

ALBANY COUNTY

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Alcove Creamery, B.	Alcove, N. Y.	Alcove Creamery Co.
Basic Valley Creamery, B.	Westerlo, N. Y.	C. P. Stevens, 120 So. Swan st., Albany, N. Y.
Berne Creamery, B.	Berne, N. Y.	C. P. Stevens, 120 So. Swan st., Albany, N. Y.
Feura Bush Elgin Creamery, B ...	Feura Bush, N. Y.	Feura Bush Elgin Creamery Co.
Medusa Creamery, B.	Medusa, N. Y.	W. G. Wright.
Potter Hollow Creamery, B.	Potter Hollow, N. Y.	G. W. Wilsie.
Preston House, Sk. Sta.	Preston Hollow, N. Y.	G. W. Wilsie, Potter Hollow.
Rensselaerville Creamery, B.	Rensselaerville, N. Y.	C. P. Stevens, 120 So. Swan st., Albany, N. Y.
South Berne, Sk. Sta.	South Berne, N. Y.	C. P. Stevens, 120 So. Swan st., Albany, N. Y.
South Westerlo Elgin Creamery, B.	South Westerlo, N. Y.	S. B. Palmer.

ALLEGANY COUNTY

Alfred, M. S.	Alfred, N. Y.	Borden's Farm Product Division, New York City.
Allentown, C.	Allentown, N. Y.	Riley Allen.
Almond, M. S.	Almond, N. Y.	Borden's Farm Product Division, New York City.
Angelica, M. S.	Angelica, N. Y.	Borden's Farm Product Division, New York City.
Angelica, C.	Angelica, N. Y.	James A. Hogue & Son.
Beech Hill, C.	Wellsville, N. Y., R. F. D.	F. H. Phillips, secretary.
Belfast, M. S.	Belfast, N. Y.	Richardson-Beebe Co., East Aurora.
Belmont, C. & M. S.	Belmont, N. Y.	Borden's Farm Product Division, New York City.
Belvidere, M. S.	Belvidere, N. Y.	Borden's Farm Product Division, New York City.
Bennett's M. S.	Angelica, N. Y., R. F. D.	Arkport Creamery Co., Arkport, N. Y.
Birdsall, C.	Birdsall, N. Y.	C. Nusbiekel, Dalton, N. Y.
Black Creek, M. S.	Black Creek.	Borden's Farm Product Division, New York City.
Brookside, C.	Rushford, N. Y.	Geo. N. Caner.
Brown & Bailey, Cond.	Andover, N. Y.	Brown & Bailey, Brooklyn, N. Y.

ALLEGANY COUNTY — (*Continued*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Caneadea, C. & M. S.....	Caneadea, N. Y.....	Richardson-Beebe Co., East Aurora.
Centerville, C. & B.....	Centerville, N. Y.....	Richardson-Beebe Co., East Aurora.
Clarksville, C.....	Clarksville, N. Y.....	M. M. Congdon.
Cold Spring, C.....	Angelica, N. Y., R. F. D. 1	A. S. Phinney.
Crawford Creek, C.....	Caneadea, N. Y., R. F. D. 1	James Murdough.
Cryder Creek, C.....	Whitesville, N. Y., R. F. D. 1	F. B. Boyce, Wellsville.
Crystal Spring, B.....	Almond, N. Y.....	C. M. Kaple.
Cuba, Cond.....	Cuba, N. Y.....	Borden's Condensed Milk Co., New York City.
Cuba Ice Cream Plant, I. C.....	Cuba, N. Y.....	W. N. Pettit & Co.
Cuba Summit, M. S.....	Cuba, N. Y., R. F. D. 1..	Borden's Farm Product Division, New York City.
Elm Valley, M. S.....	Wellsville, N. Y., R. F. D.	Borden's Farm Product Division, New York City.
Fillmore, Cond. & M. S.....	Fillmore, N. Y.....	Richardson-Beebe Co., East Aurora.
Five Corners, C.....	Almond, N. Y., R. F. D. 1	Efner E. Potter.
Ford's Brook, C.....	Wellsville, N. Y., R. F. D.	Mark Costello, Wellsville.
Friendship, M. S.....	Friendship, N. Y.....	Borden's Farm Product Division, New York City.
Green's Corners, C.....	Andover, N. Y., R. F. D...	John Costello.
Hallsport, C.....	Wellsville, N. Y., R. F. D. 2	Mark Costello, Wellsville.
Hallsport, M. S.....	Wellsville, N. Y.....	Borden's Farm Product Division, New York City.
Hardy's Corners, C.....	Cuba, N. Y., R. F. D....	C. E. Pettit.
Houghton, C. & M. S.....	Houghton, N. Y.....	Richardson-Beebe Co., East Aurora.
Inavale, C.....	Friendship, N. Y., R. F. D	B. C. Pierce.
Jersey Hill, C.....	Arkport, N. Y., R. F. D..	Daniel Manning.
Karr Valley, C.....	Almond, N. Y., R. F. D..	B. C. Brasted.
Keeney, C.....	Whitney Crossing, N. Y., R. F. D. 1.....	C. H. Perkus.
Keller Hill, C.....	Cuba, N. Y., R. F. D. 3..	E. S. Moses.
Kelloggsville, C.....	Caneadea, N. Y., R. F. D. 2	F. W. Hogue, Cuba.
Keystone, C.....	Angelica, N. Y.....	John McCubbin.
Lafferty, C.....	Cuba, N. Y., R. F. D....	W. N. Pettit, Cuba.
Little Genesee, C.....	Little Genesee, N. Y.....	J. E. Case.
McGrawville, C.....	Black Creek, N. Y., R. D.	F. W. Hogue, Cuba.
Mt. Monroe, C.....	Rushford, N. Y., R. F. D.	F. W. Hogue, Cuba.
New Union, C.....	Fillmore, N. Y., R. F. D.	T. Eberhart.
North Branch, C.....	Black Creek, R. F. D....	John Boller.
North Hill, C.....	Wellsville, N. Y., R. F. D.	C. C. Hull, Wellsville.
Nusbickel, C.....	Dalton.....	Chas. Nusbickel.
Obi, C.....	Clarksville, N. Y.....	M. M. Congdon.
Oramel, M. S. & C.....	Oramel, N. Y.....	Richardson-Beebe Co., East Aurora.
Parker, C.....	Dalton, N. Y.....	Chas. Lockwood.
Petrolia, C.....	Wellsville, N. Y., R. F. D.	Wm. Costello, Wellsville.
Podonque, C.....	Rushford, N. Y.....	P. B. Loftis, Houghton.

ALLEGANY COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Pratt's Mills, C.	Fillmore, N. Y., R. F. D. .	Wm. Harris, Rushford.
Rawson, C.	Cuba, N. Y., R. F. D. .	F. W. Hogue, Cuba.
Richburg, C.	Richburg, N. Y.	Milo Babbett.
Rockville, C. & M. S.	Rockville, N. Y.	Richardson-Beebe Co., East Aurora.
Rosburg, C.	Hume, N. Y.	R. Davis.
Rushford, C.	Rushford, N. Y.	F. W. Hogue, Cuba.
Scio, Cond. & M. S.	Scio, N. Y.	Borden's Farm Product Division, New York City.
Shongo, C.	Shongo, N. Y.	E. J. Johnson.
Short Track, C.	Fillmore, N. Y., R. F. D. .	Richardson-Beebe Co., East Aurora.
Silners' Ice Cream Plant.	Belfast.	R. H. Silners.
Slater Creek, C.	Canaseraga, N. Y.	John Swain.
South Cuba, C.	Cuba, N. Y., R. F. D. 3. .	E. S. Moses.
South Eagle, C.	Centerville, N. Y.	Wm. Harris, Rushford.
South Valley, C.	Canaseraga, N. Y.	Mary Moore.
Standard Corners, M. S.	Wellsville, N. Y.	Borden's Farm Product Division, New York City.
Star, C.	Fillmore, N. Y.	Wm. Harris, Rushford.
Tip Top, C.	Alfred Station, N. Y.	A. C. Baker.
Vandermark, No. 1, C.	Scio, N. Y.	L. G. Tucker.
Wadsworth Hill, C.	Scio, N. Y., R. F. D. .	F. W. Brasted.
Wellsville, M. S.	Wellsville, N. Y.	Borden's Farm Product Division, New York City.
Wellsville Dairy Products, C.	Wellsville, N. Y.	Geo. M. Horner.
West Almond, C.	Almond, N. Y., R. F. D. 1. .	A. A. Raymond.
West Hill, C.	Caneadea, N. Y., R. F. D. .	F. W. Hogue, Cuba.
West Branch, C.	Franklinville, N. Y., R. F. D. 3.	F. W. James.
West Nile, C.	Nile, N. Y.	Henry Wyant.
White Creek, C. F.	Black Creek, N. Y., R. F. D. 3.	F. S. Guilford.
Whitesville Dairy Co., C.	Whitesville, N. Y.	Whitesville Dairy Co.
Willet Estate, C.	Belmont, N. Y.	Willet Estate.
Wilson, C.	Black Creek, N. Y.	E. S. Moses, Cuba, R. D.
Wirt Center, C.	Nile, N. Y., R. F. D. .	Henry Wyant, Nile.

BROOME COUNTY

Arnold, B.	Lisle, N. Y.	Jesse Arnold.
Barker, M. S.	Barker, N. Y.	Hudson Milk & Cream Co., 170 Sixth st., Hoboken, N. J.
Barnum, M. S.	Johnson City, N. Y.	Chas. W. Barnum.
Binghamton Ice Cream Co., M. S. .	Binghamton, N. Y.	Binghamton Ice Cream Co.
Broome County, M. S.	Binghamton, N. Y.	Binghamton Ice Cream Co.
Center-Lisle-Borden, M. S.	Center Lisle, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Center Lisle-High Ground, M. S. .	Center Lisle, N. Y.	High Ground Dairy Co., 447 Madison Ave., Brooklyn, N. Y.
Center Village, M. S.	Center Village, N. Y.	Sheffield Farms Slawson Decker Co., 524 West 57th st., New York City.
Chadwicks, M. S.	Binghamton, N. Y.	C. E. Chadwick, 239 Vestal ave.

BROOME COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Cloughs Corner, B. & C.....	Whitney's Point, N. Y.....	F. W. Janssen, 316 Garden st. Hoboken, N. J.
Clover Farms, M. S.	Binghamton, N. Y.....	Clover Farms Co., 60 Exchange st.
Conklin, M. S.	Corbettsville, N. Y.....	Sheffield Farms, Slawson Decker Co., 524 West 57th st., New York City.
Crowley, M. S.	Binghamton, N. Y.....	Crowley Milk Co.
Deposit-Borden, M. S.....	Deposit, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Deposit-Mutual, M. S.....	Deposit, N. Y.....	Mutual McDermott Dairy Co., 214 East 22nd st., New York City.
East Windsor, M. S.....	East Windsor, N. Y.....	Sheffield Farms, Slawson Decker Co., 524 West 57th st., New York City.
Endicott, M. S.....	Endicott, N. Y.....	Endicott Creamery Co.
Endicott-Borden, M. S.....	Endicott, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Evergreen, M. S.....	Binghamton, N. Y.....	Lee & Heath, Winding Way.
Gulf Summit, M. S.....	Gulf Summit, N. Y.....	Alex. Campbell Milk Co., 802 Fulton st., Brooklyn, N. Y.
Halls, M. S.....	Binghamton, N. Y.....	Hall & Co., 33 Court st.
Harpersville, M. S.....	Harpersville, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Honey Bee Farms, M. S.....	Port Dickinson, N. Y.....	F. W. Parsons.
Jones, M. S.....	Binghamton, N. Y.....	Levi W. Jones.
Killawog, M. S.....	Killawog, N. Y.....	C. D. Stretch.
Kirkwood, M. S.....	Kirkwood, N. Y.....	N. Y. Dairy Produce Co., 388-392 Oakland st., Brooklyn, N. Y.
Langdon, M. S.....	Kirkwood, N. Y.....	Alex. Campbell Milk Co., 802 Fulton st., Brooklyn, N. Y.
Lisle-Borden, M. S.....	Lisle, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Lisle-High Ground, M. S.....	Lisle, N. Y.....	High Ground Dairy Co., 447 Madison st., Brooklyn, N. Y.
Maine, B.....	Maine, N. Y.....	Kinney Bros.
Mattoon, M. S.....	Endicott, N. Y.....	Miller & Sturges.
McClure, M. S.....	McClure, N. Y.....	Ideal Dairy Co., 203 West 20th st., New York City.
McNamara & Hickey, M. S.....	Binghamton, N. Y.....	McNamara & Hickey, 238½ Clinton st.
Nanticoke, B.....	Nanticoke, N. Y.....	H. R. Hurley, Hope, N. Y.
North Fenton, M. S.....	Chenango Forks, N. Y., R. F. D. 1.....	John F. Wildi, Evap. Milk Co., Columbus, Ohio.
Ouaquaga, C.....	Ouaquaga, N. Y.....	W. J. Peach, Pulaski, N. Y.
Robinson, M. S.....	Binghamton, N. Y.....	W. Hotaling, 22 Edwards st.
Sanataria Springs, M. S.....	Binghamton, N. Y.....	Meyer Zausner, 1504 Park ave., New York City.
Sanford, B.....	Sanford, N. Y.....	C. D. Eldred.

BROOME COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Schoonover, M. S.	Johnson City, N. Y.	W. T. Schoonover.
Triangle, B. & C.	Triangle, N. Y.	F. W. Janssen, 316 Garden st., Hoboken, N. J.
Tunnell, Station, C.	Tunnell, N. Y.	Vito Villecco.
Tunnell-Borden, M. S.	Tunnell, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Tunnell-Stevens, M. S.	Tunnell, N. Y.	R. F. Stevens Co., 94 Third ave., Brooklyn, N. Y.
Union Center, B.	Union Center, N. Y.	Binghamton Ice Cream Co., Binghamton, N. Y.
Upper Lisle-Borden, M. S.	Whitney Point, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Vallonia, B.	Nineveh, N. Y., R. F. D.	Brown & Root Co., 167 Reade st., New York City.
Windsor, M. S.	Windsor, N. Y.	Empire State Dairy Co., 502 Broadway, Brooklyn, N. Y.
Whitney Point-Borden, M. S.	Whitney Point, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Whitney Point-Janssen, M. S.	Whitney Point, N. Y.	F. W. Janssen, 316 Garden st., Hoboken, N. J.

CATTARAUGUS COUNTY

Abbotts, No. 2 C.	Franklinville, N. Y., R. F. D. 4.	George Nix, Ischua.
Ashford Hollow, C.	West Valley, N. Y., R. F. D.	Clifford Bond, Springville.
Ashford Junction, C.	Ashford, N. Y.	E. L. Jones, Delevan.
Axville, C.	Conewango Valley, N. Y., R. F. D.	H. S. Sweetland, South Dayton.
Bakerstand, C.	Machias, N. Y., R. F. D. 1.	E. L. Jones, Delevan.
Bedford Corners, C.	Portville, N. Y., R. F. D.	E. L. Jones, Delevan.
Bellows, C.	West Valley, N. Y., R. F. D.	Isaac Neff.
Bleck, C.	Delevan, N. Y., R. D. 1.	E. L. Jones, Delevan.
Brooks Creamery, M. S.	Olean, N. Y.	H. K. Brooks, 127 Bayey st.
Broadway, C.	Gowanda, N. Y.	J. F. Hanson.
Bucktooth, C.	Little Valley, N. Y., R. F. D. 2.	Ira Marsh.
Bullock, C.	Franklinville, N. Y., R. F. D.	Geo. E. Hogue, Arcade, N. Y.
Bush, I. C.	South Dayton, N. Y.	F. T. Bush.
California Hill, C.	Ellicottville, N. Y., R. F. D.	G. C. Wulff.
Canada Hill, C.	Machias, N. Y., R. F. D. 1.	E. L. Jones, Delevan.
Cattaraugus, C.	Cattaraugus, N. Y.	Rich Jersey Creamery Co.
Cattaraugus, M. S.	Cattaraugus, N. Y.	Queen City Dairy Co., Buffalo.
City Milk Depot, M. S.	Salamanca, N. Y.	Samuel S. Nelson.
Conewango, B. & M. S.	Conewango Valley, N. Y., R. F. D. 1.	Rich Jersey Creamery Co., Cattaraugus.
Dayton, M. S.	Dayton, N. Y.	Rich Jersey Creamery Co., Cattaraugus.
Delevan, C.	Delevan, N. Y.	E. L. Jones, Delevan.

CATTARAUGUS COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
East Otto, No. 1 C.	East Otto, N. Y.	Gibby & Evans, Cattaraugus.
East Otto, No. 2 C.	East Otto, N. Y.	Gibby & Evans, Cattaraugus.
East Otto, No. 3 C.	East Otto, N. Y.	Gibby & Evans, Cattaraugus.
East Otto, No. 4 C.	East Otto, N. Y.	Gibby & Evans, Cattaraugus.
East Otto, No. 5 C.	East Otto, N. Y.	Gibby & Evans, Cattaraugus.
East Otto, No. 6 C.	Gowanda, N. Y.	Gibby & Evans, Cattaraugus.
Elko, C.	Tunesassa, N. Y.	H. S. Sweetland, South Dayton.
Fairview, C.	Farmersville Sta. N. Y., R. F. D.	E. L. Jones, Delevan.
Fay Hollow, C.	Olean, N. Y., R. F. D.	F. W. Hogue & Co., Cuba.
Farmersville Center, C.	Farmersville, N. Y.	Geo. E. Hogue, Arcade.
Farmersville Sta., C.	Farmersville, N. Y.	Merrill-Soule Co., Syracuse,
Franklinville, C. & M. S.	Franklinville, N. Y.	Sheffield Farms S. D. Co., New* York City.
Franklinville, No. 4 C.	Humphrey, N. Y.	W. L. Hogue & Son, Hinsdale.
Franklinville, No. 6 C.	Humphrey Center, N. Y.	W. L. Hogue & Son, Hinsdale.
Franklinville, No. 7 C.	Allegany, N. Y., R. F. D. 1.	W. L. Hogue & Son, Hinsdale.
Franklinville, No. 12 C.	Humphrey, N. Y., R. F. D.	W. L. Hogue & Son, Hinsdale.
Franklinville, No. 15 C.	Allegany, N. Y., R. F. D.	W. L. Hogue & Son, Hinsdale.
Franklinville, No. 16 C.	Franklinville, N. Y., R. F. D. 4.	W. L. Hogue & Son, Hinsdale.
Franktown, C.	Springville, N. Y., R. F. D. 1.	E. L. Jones, Delevan, N. Y.
Freedom, C.	Freedom, N. Y.	S. J. Owens Est.
Fitch, M. S.	Franklinville, N. Y., R. F. D.	Sheffield Farms S. D. Co., New York City.
Glen Brook, C.	West Valley, N. Y., R. F. D.	E. L. Jones, Delevan.
Glen Brook, No. 2 C.	Great Valley, N. Y.	Walrath & Ryan.
Glen Brook, No. 3 C.	Great Valley, N. Y., R. F. D.	Walrath & Ryan, Great Valley.
Grand Central, C.	Great Valley, N. Y., R. F. D.	Walrath & Ryan, Great Valley.
Hasselback, No. 16 C.	Springville, N. Y., R. F. D.	Hasselback Cheese Co., Buffalo.
Hasselback, No. 20 C.	West Valley, N. Y.	Hasselback Cheese Co., Buffalo.
Hinman Valley, C.	Ellicottville, N. Y.	Martha Jenkel.
Hinsdale, M. S.	Hinsdale, N. Y.	Borden's Farm Product Division, New York City.
Holmes, C.	Farmersville Sta., N. Y.	Wellie Holmes.
Irish Hill, C.	Ashford, N. Y., R. F. D.	E. L. Jones, Delevan.
Ischua, M. S.	Ischua, N. Y.	Sheffield Farms, S. D. Co., New York City.
Klens, C.	Cattaraugus, N. Y., R. F. D.	W. H. Klens.
Laidlaw, C.	Franklinville, N. Y., R. F. D. 2.	Merrill-Soule Co., Syracuse.
Laidlaw Hill, C.	Franklinville, N. Y., R. F. D. 4.	W. L. Hogue & Son, Hinsdale.
Lebanon, C.	Randolph, N. Y.	E. L. Jones, Delevan.
Leon, Cond.	Leon, N. Y.	Hoefler Ice Cream Co., Buffalo.
Lime Brook, C.	Otto, N. Y.	P. F. Jark.

CATTARAUGUS COUNTY — (Unconcluded)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Lime Lake, M. S.	Lime Lake, N. Y.	Queen City Dairy Co., Buffalo.
Limestone, C.	Limestone, N. Y.	Frank Larson.
Little Valley, Cr. & P. M.	Little Valley, N. Y.	Merrill-Soule Co., Syracuse.
Lower Haskell, C.	Portville, N. Y.	E. L. Jones, Delevan.
Lyndon, C.	Franklinville, N. Y., R. F. D.	W. L. Hogue & Son, Hinsdale.
Machias, C.	Machias, N. Y., R. F. D.	E. L. Jones, Delevan.
Mansfield Spring Brook, C.	Little Valley, N. Y.	C. J. Buskist, Cattaraugus.
Maple Hurst, C.	Hinsdale, N. Y.	Peter Elling.
Markham, M. S.	South Dayton, N. Y., R. F. D.	Queen City Dairy Co., Buffalo.
McKinstry, C.	Delevan, N. Y., R. F. D.	E. L. Jones, Delevan.
Napoli Dairyman's Assn., C.	Napoli, N. Y.	Freeman Waite.
New Albion Spring Brook, C.	New Albion, N. Y.	C. J. Buskist, Cattaraugus.
Nine Mile Union, C.	Allegany, N. Y.	J. R. Karl.
North Perrysburg, C.	Perrysburg, N. Y.	Richard Maynard.
North Valley, C.	Salamanca, N. Y., R. F. D.	Carl Ellis.
Onoville, B.	Onoville, N. Y.	Fred Seitz.
Orlando, C.	Ellicottville, N. Y.	Gust Wulff.
Peaslee, C.	Napoli, N. Y., R. F. D.	H. S. Sweetland, South Dayton.
Peacevale, C.	Cattaraugus, N. Y., R. F. D.	C. J. Rich, Cattaraugus.
Perrysburg, C.	Perrysburg, N. Y.	H. S. Sweetland, South Dayton.
Persia Spring Brook, C.	Gowanda, N. Y., R. F. D.	H. J. Gould.
Plato Union, C.	Ellicottville, N. Y., R. F. D.	John H. Wulff, Springville.
Portville, M. S.	Portville, N. Y., R. D.	R. F. Stevens Co., 82 Third ave., Brooklyn, N. Y.
Powder Milk Co. of America.	South Dayton, N. Y.	Powder Milk Co. of America, New York City.
Randolph, Cond.	Randolph, N. Y.	Borden's Cond. Milk Co., New York City.
Red House, C.	Red House, N. Y.	Eugene Whaley.
Riceville, C.	West Valley, N. Y. R. F. D.	E. L. Jones, Delevan.
Rock Spring, C.	Franklinville, N. Y., R. F. D.	F. W. Hogue & Co., Cuba.
Ross, No. 1 C.	Gowanda, N. Y., R. F. D.	R. P. Ross.
Steamburg, C. & B.	Steamburg, N. Y., R. F. D.	E. L. Jones, Delevan.
Stone, C.	Franklinville, N. Y., R. F. D. 5.	Wm. J. Bush, Franklinville, R. F. D. 1.
Summer Valley, C.	Ellicottville, N. Y., R. F. D.	E. L. Jones, Delevan.
Upper Haskell, C.	Cuba, N. Y., R. F. D. 3.	F. W. Hogue, Cuba.
Vedders Corners, C.	Ashford, N. Y., R. F. D.	John H. Wulff, Springville.
West Valley, C.	West Valley, N. Y.	E. L. Jones, Delevan.
West Valley, C.	West Valley, N. Y., R. F. D.	Bohner & Seibert, 821 Genesee st., Buffalo.
Wesley, C.	Cattaraugus, N. Y., R. F. D.	A. Howard.
White School House, C. & B.	Machias, N. Y., R. F. D.	E. L. Jones, Delevan.
Wolf Run, C.	Cuba, N. Y., R. F. D. 3.	E. L. Jones, Delevan.
Wright, No. 8 C.	Great Valley, N. Y.	W. L. Hogue & Son, Hinsdale.

CAYUGA COUNTY

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Bell Town, Sk. Sta.....	Poplar Ridge, N. Y.....	Ira Gifford.
Bisgrove, M. S.....	Auburn, N. Y.....	Bisgrove Bros., 11 Paul st.
Brick Church, M. S.....	Weedsport, N. Y., R. F. D.....	Levy Dairy Co. 19th st. and Avenue B, New York City.
Cato-Cohen, M. S.....	Cato, N. Y.....	I. Cohen, 16 Moore st., Brooklyn, N. Y.
Cato-Smith, M. S.....	Cato, N. Y.....	Jacob Smith, 590 Water st., New York City.
Cayuga, M. S.....	Auburn, N. Y.....	Cayuga Co. Dairy Co.
Conquest, B.....	Port Byron, N. Y.....	Conquest Elgin Creamery Co.
Covert, C.....	Moravia, N. Y.....	Dwight Covert.
Dresserville, B.....	Moravia, N. Y.....	H. B. Livermore.
East Venice, Sk. Sta.....	Ithaca, N. Y.....	Department Dairy Industry, Cornell University.
Emerson, Sk. Sta.....	Port Byron, N. Y.....	Port Byron Creamery Co.
Ensenore, M. S.....	Ensenore, N. Y.....	Frank J. Clark.
Fair Haven, M. S.....	Fair Haven, N. Y.....	R. F. Stevens Co., 82 Third ave., Brooklyn, N. Y.
Genoa, M. S.....	Genoa, N. Y.....	R. F. Stevens Co., 82 Third ave. Brooklyn, N. Y.
Greenfield, C.....	Moravia, N. Y.....	Roscoe Coon.
Ira, M. S.....	Ira, N. Y.....	Levy Dairy Co., 19th st. and Avenue B, Brooklyn, N. Y.
Kings Ferry, Sk. Sta.....	Poplar Ridge, N. Y.....	Ira Gifford.
Locke, M. S.....	Locke, N. Y.....	R. F. Stevens Co., 82 Third ave., Brooklyn, N. Y.
Mapleton, Sk. Sta.....	Mapleton, N. Y.....	Oakwood Creamery Co., Oakwood, N. Y.
Martville, M. S.....	Martville, N. Y.....	Jacob Smith, 590 Water st., New York City.
Meridian, B.....	Meridian, N. Y.....	Floyd Smith.
Merrifield, M. S.....	Merrifield, N. Y.....	Edward Byrnes.
Moravia, B. & C.....	Moravia, N. Y.....	G. N. Sloane.
Moravia, M. S.....	Moravia, N. Y.....	Standard Dairy Co., 611 East 12th st., New York City.
New Hope, B.....	Moravia, N. Y., R. F. D. 14.....	New Hope Creamery Co.
Oakwood, B.....	Oakwood, N. Y.....	Oakwood Creamery Co.
Pine Hollow, M. S.....	Locke, N. Y., R. F. D. 22.....	Acme Elgin Creamery Co.
Poplar Ridge, B.....	Poplar Ridge, N. Y.....	Ira Gifford.
Port Byron, B.....	Port Byron, N. Y.....	Port Byron Creamery Co.
Sayles Cors., B. & C.....	Moravia, N. Y., R. F. D.....	S. S. Brown, 156 Reade st., New York City.
Sempronius, B.....	Sempronius, N. Y.....	Jay Beyea, Moravia, N. Y.
Spring Lake, Sk. Sta.....	Spring Lake, N. Y.....	Shefford Cheese Co., 419 Fulton st., Syracuse, N. Y.
Sterling Center, C.....	Sterling Station, N. Y.....	D. C. Muckey, Sterling Junction, N. Y.
Sterling Valley, C.....	Sterling Station, N. Y.....	D. C. Muckey, Sterling Junction, N. Y.
Summer Hill, Sk. Sta.....	Cortland, N. Y.....	Frank A. Ranney.
Throop, M. S.....	Auburn, N. Y., R. F. D.....	Levy Dairy Co., 19th st. and Avenue B, Brooklyn, N. Y.
Union Springs, B.....	Union Springs, N. Y.....	W. D. Griffen.

CAYUGA COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Venice Center, M. S.	Venice Center, N. Y.	Jacob Smith, 590 Water st., New York City.
Victory, B.	Cato, N. Y., R. F. D.	L. L. Coppennall, Port Byron, N. Y.
Weedsport, M. S.	Weedsport, N. Y.	R. F. Stevens, Co. 82 Third ave., Brooklyn, N. Y.

CHAUTAUQUA COUNTY

Abby, C.	Cherry Creek, N. Y., R. F. D.	E. F. Grant.
Arkwright Center, C.	Fredonia, N. Y.	F. W. Horton.
Arkwright Union, C.	Cassadaga, N. Y.	W. C. Ridout.
Bemus Point, C.	Bemus Point, N. Y.	J. B. Kelly.
Briggs Dairy, M. S.	Dunkirk, N. Y.	N. S. Briggs, 65 Middle rd.
Cassadaga, B.	Burnham, N. Y.	Jonas A. Hedges.
Centralia, C.	Sinclairville, N. Y.	W. H. Bates.
Chautauqua Institute Milk Market, M. S.	Chautauqua, N. Y.	Chautauqua Institute Association.
Cherry Creek, Sk. Sta.	Cherry Creek, N. Y.	Hoefer Ice Cream Co., Buffalo, N. Y.
City Dairy, M. S.	Dunkirk, N. Y.	Herbert E. Booth.
Clymer, Cond.	Clymer, N. Y.	The Mohawk Condensed Milk Co., New York City.
Dean, C.	Mayville, N. Y., R. F. D.	I. N. Gampp, Stockton.
Dry Brook, C.	Kennedy, N. Y.	H. S. Sweetland, South Dayton.
Findley Lake, B.	Findley Lake, N. Y.	C. C. Webber.
French Creek, C. & B.	Clymer, N. Y., R. F. D. 57	Erie County Milk Assoc., Erie, Pa.
Frewsburg, P. M. & B.	Frewsburg, N. Y.	Merrell-Soule Co., Syracuse, N. Y.
Gerry Creamery, B.	Gerry, N. Y.	Fred Anderson.
Gerry Hill, C.	Gerry, N. Y., R. F. D.	H. S. Sweetland, South Dayton.
Goshen, C.	North Clymer, N. Y.	H. S. Munson, Westfield.
Kennedy, C.	Kennedy, N. Y.	H. S. Sweetland, South Dayton.
Levant, B.	Falconer, N. Y.	C. E. Limberg.
Mayville, M. S.	Mayville, N. Y.	Supplee Alderney Dairy Co., Philadelphia, Pa.
Nashville, C. & B.	Silver Creek, N. Y., R. F. D.	H. S. Sweetland, South Dayton.
Niobe, C.	Niobe, N. Y.	Burt A. Bullock.
Panama, B.	Panama, N. Y.	Tripp & Muzzy.
Pleasantville, C.	Dewittville, N. Y.	Charles W. Phillips.
Rood, C.	Sinclairville, N. Y., R. F. D.	A. J. Rood.
Ross Valley, B.	Falconer, N. Y.	A. B. Grover.
Ruttenbur, C.	Hamlet, N. Y.	Ruttenbur Bros.
Sanitary Milk Co., M. S.	Dunkirk, N. Y.	Geo. Ostrye.
Sherman, Cond.	Sherman, N. Y.	The Mohawk Condensed Milk Co., New York City.
Sinclairville, Cond.	Sinclairville, N. Y.	Borden's Condensed Milk Co., New York City.
South Ripley, C.	North East, Pa.	Thomas Stetson.
Spring Valley, C.	Cherry Creek, N. Y., R. F. D.	C. L. Frost.
Stockton, C.	Cassadaga, N. Y., R. F. D.	I. N. Gampp.

CHAUTAUQUA COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Summerdale, M. S.....	Mayville, N. Y., R. F. D.	Supplee Alderney Dairy Co., Philadelphia, Pa.
Thornton, C.....	Ellington, N. Y.....	H. S. Sweetland, South Dayton.
Villanova, C.....	South Dayton, N. Y., R. F. D.....	H. S. Sweetland, South Dayton.
Walker Farm, Sk. Sta.....	Jamestown, N. Y., R. F. D.....	Walker Ice Cream Co., Warren, Pa.
Warner, C.....	Cherry Creek, N. Y., R. F. D.....	H. S. Sweetland, South Dayton.
Watts Flats, Sk. Sta.....	Watts Flats, N. Y.....	Taylor Milk Products Co., Buffalo.
West Ellery, C.....	Bemus Point, N. Y., R. F. D.....	F. W. Stowell.

CHEMUNG COUNTY

Atwater Bros. Factory, B.....	Elmira, N. Y.....	Frank D. & Floyd A. Atwater, 401 Division st., Elmira, N. Y.
Breesport, M. S.....	Elmira, N. Y.....	Atwater Bros., 401 Division st., Elmira.
Brown & Bailey, M. S.....	Erin, N. Y.....	Brown & Bailey, 88-94 Third ave., Brooklyn, N. Y.
Chemung Factory, M. S.....	Chemung, N. Y.....	Keystone Dairy Co., 622 Madison ave., Hoboken, N. J.
Chemung Valley, Cond.....	Big Flats, N. Y.....	Brown & Bailey, 88-94 Third ave., Brooklyn, N. Y.
Elmira Pure Milk Co.....	Elmira, N. Y.....	Elmira Pure Milk Co., 108-110 Ferris st., Elmira, N. Y.
Erin, M. S.....	Erin, N. Y.....	Horseheads Creamery Co., Horseheads, N. Y.
Horseheads Co., C.....	Horseheads, N. Y.....	Horsehead Creamery Co.
Newark Milk & Cream Co.....	Wellsburgh, N. Y.....	Newark Milk & Cream Co., 22 Bridge st., Newark, N. J.
Royal Dairy Co., B.....	Elmira, N. Y.....	Royal Dairy Co., 665 Lake st.
Swartwood Factory, B.....	Swartwood, N. Y.....	Empire Creamery Co., 335 Hamilton st., Allentown, Pa.
Van Etten, M. S.....	Van Etten, N. Y.....	Horseheads Creamery Co., Horseheads, N. Y.

CHENANGO COUNTY

Afton, M. S.....	Afton, N. Y.....	Clover Farms, Inc., 534 West 48th st., New York City.
Afton-Borden.....	Afton, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Bainbridge Milk Co., M. S.....	Bainbridge, N. Y.....	John F. Wildi Cond. Milk Co., Columbus, Ohio.
Bainbridge-National, M. S.....	Bainbridge, N. Y.....	National Milk Sugar Co.
Bainbridge-Sheffield, M. S.....	Bainbridge, N. Y.....	Sheffield Farms, Slawson Decker Co., 524 West 57th st., New York City.
Bonney, C.....	Bonney, N. Y.....	Cohen Dairy Co., 60 Lennox ave., New York City.

CHENANGO COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Brisben, M. S.	Brisben, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Columbus, M. S.	South Edmeston, N. Y.	Phenix Cheese Co., 345 Green- wich st., New York City.
Cottage, C.	Sherburne, N. Y.	Wm. Casey.
Coventry, C.	Coventry, N. Y.	Sullivan County Creamery Co., Jeffersonville, N. Y.
Coventryville, B. & C.	Coventryville, N. Y.	Coventryville Cooperative But- ter & Cheese Co.
Deer Spring, C.	Oxford, N. Y.	C. Stiles.
Earlville-Baldwin, M. S.	Earlville, N. Y.	F. W. Janssen, 316 Garden st., Hoboken, N. J.
Earlville-Borden, M. S.	Earlville, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Earlville-Hewer, M. S.	Earlville, N. Y.	Otto Hewer, 319 Lewis st., Union Hill, N. J.
East Pharsalia, B. & C.	East Pharsalia, N. Y.	Geo. H. Hall.
East Guilford, M. S.	East Guilford, N. Y.	Rockdale Creamery Co., Rock- dale, N. Y.
Ekenburg, B. & C.	South Otselic, N. Y.	The Ekenburg Co., Cortland, N. Y.
Galena, M. S.	North Norwich, N. Y.	Otto Gruhn, 223 Borum st., Brooklyn.
German, Sk. Sta.	Cincinnati, N. Y., R. F. D.	Cincinnati Dairy Co., Cincin- natus, N. Y.
Greene, M. S.	Greene, N. Y.	Empire State Dairy Co., 502 Broadway, Brooklyn, N. Y.
Guilford, M. S.	Guilford, N. Y.	Sheffield Farms, Slawson Decker Co., 524 West 57th st., New York City.
Harbor, B. & C.	Greene, N. Y.	Harbor Creamery Co.
Haynes, M. S.	Norwich, N. Y.	I. W. Rushmore Co., 100 Atlantic ave., Brooklyn, N. Y.
Hillside, C.	Sherburne, N. Y.	A. T. Gahan.
Holmesville, M. S.	Holmesville, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Kirk, B. & C.	Kirk, N. Y.	W. E. Huntley.
Lincklaen, B. & C.	Lincklaen, N. Y.	W. M. Pforter.
Lyon Brook & Star, B. & C.	Norwich, N. Y.	O. P. Phetteplace.
Maple Grove, C.	Smithville Flats, N. Y.	Maple Grove Creamery Co.
McDonough-Elgin, B.	McDonough, N. Y.	McDonough-Elgin Creamery Co.
New Berlin, M. S.	New Berlin, N. Y.	Levy Dairy Co., 19th st. and Avenue B, Brooklyn, N. Y.
New Berlin Cooperative Creamery Co.	New Berlin, N. Y.	New Berlin Cooperative Creamery Co.
Nineveh Junction, M. S.	Nineveh Junction, N. Y.	I. Liber, 16 East 107th st., New York City.
Norwich, M. S.	Norwich, N. Y.	Herbert Smith.
Norwich, Cond.	Norwich, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.

CHENANGO COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Norwich-Rushmore, M. S.	Norwich, N. Y.	I. W. Rushmore Co., 100 Atlantic ave., Brooklyn, N. Y.
North Otselic, B. & C.	Otselic, N. Y.	Otselic Factory Co.
North Pharsalia, B. & C.	North Pharsalia, N. Y.	H. J. Barden.
North Pitcher, B. & C.	North Pitcher, N. Y.	Miles Loomis.
Otselic Center, B. & C.	Otselic, N. Y.	B. Fred Saunders, Georgetown.
Oxford, M. S.	Oxford, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Parker, M. S.	Guilford Center, N. Y.	Wm. Jorden.
Pharsalia Hook, B. & C.	Pharsalia, N. Y.	R. Hibbard.
Pitcher, B. & C.	Pitcher, N. Y.	Riverdale Creamery Co.
Plymouth, B. & C.	Plymouth, N. Y.	G. W. Shoales.
Rockdale, M. S.	Rockdale, N. Y.	Rockdale Creamery Co.
Shamrock & Thistle, B. & C.	Norwich, N. Y.	Gibson & Bixby.
Sherburne, M. S.	Sherburne, N. Y.	Standard Dairy Co., 611 East 12th st., New York City.
Sherburne Four Corners, M. S.	Sherburne Four Corners, N. Y.	Standard Dairy Co., 611 East 12th st., New York City.
Smithville Center, C.	Greene, N. Y., R. F. D. 1.	Smithville Center Cheese Co.
Smithville Flats, C.	Smithville Flats, N. Y.	Empire State Dairy Co., 502 Broadway, Brooklyn, N. Y.
Smyrna, M. S.	Smyrna, N. Y.	Mutual-McDermott Dairy Corp., 214 East 22nd st., New York City.
South New Berlin, M. S.	South New Berlin, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
South Otselic, B. & C.	South Otselic, N. Y.	J. E. Japhet.
Stillwater, M. S.	Greene, N. Y.	F. W. Janssen, 316 Garden st., Hoboken, N. J.
Tarbell Farms, B.	Smithville Flats, N. Y.	Gage E. Tarbell, 320 Fifth ave., New York City.
Trestle, M. S.	Guilford Center, N. Y.	Wm. Jorden.
Union Valley, B. & C.	Union Valley, N. Y.	Union Valley Creamery Co.
Willards, M. S.	Chenango Forks, N. Y.	Otto Gruhn, 223 Borum st., Brooklyn, N. Y.
Woods Crossing, M. S.	Norwich, N. Y.	High Ground Dairy Co., 447 Madison st., Brooklyn, N. Y.

CLINTON COUNTY

Altona, M. S. & C.	Altona, N. Y.	Tietjen Bros., 506 East 118 st., New York City.
Beekmantown Creamery	Beekmantown, N. Y.	Silver Spring Creamery Co., West Chazy, N. Y.
Cannon Creamery, B.	Mooers Forks, N. Y.	H. R. Tate.
Champlain M. S.	Champlain, N. Y.	Mutual McDermott Dairy Co., New York City.
Chazy Creamery, B.	Chazy, N. Y.	Boomerhower Grocery Co., Plattsburg, N. Y.
Churubusco, M. S. & C.	Churubusco, N. Y.	Sheffield Farms, Slawson Decker Co., 524 West 57th st., New York City.

CLINTON COUNTY — (Concluded)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Clark Farm Creamery, M. S.	Peru, N. Y.	Datus Clark.
Clinton Creamery, B.	Frontier, N. Y.	E. P. O'Neil.
Clinton Mills, M. S.	Clinton Mills, N. Y.	F. H. Wempe, 678 East 113th st., New York City.
Clover Leaf, B.	Morrisonville, N. Y.	Schuyler Falls Cooperative Association, Morrisville, N. Y.
Coopersville Creamery	Coopersville, N. Y.	Silver Spring Creamery Co., West Chazy, N. Y.
Crystal Spring Creamery	Ellenburg Depot, N. Y. ...	Haughran & Myers.
Disco Creamery, B.	Disco, N. Y.	A. Cussan.
Disco, Sk. Sta.	Disco, N. Y.	A. Cussan.
Dunn Farm Creamery, B.	Chazy, N. Y.	Seth Gordon.
Ellenburg Milk Sta.	Ellenburg, N. Y.	Mutual McDermott Dairy Co., 214 East 22d st., New York City.
Forest, M. S.	Forest, N. Y.	Sheffield Farms, Slawson Decker Co., New York City.
Harkness Creamery, B.	Harkness, N. Y.	Peru Creamery Co., Peru, N. Y.
High Land Creamery, B.	Churubusco, N. Y.	Wm. Nichols.
Ingerham Creamery, Sk. Sta.	West Chazy, N. Y.	Silver Spring Creamery Co.
Irona Creamery, B.	Irona, N. Y.	Trombley Bros., Altona, N. Y.
Lake Side Creamery, B.	Plattsburg, R. F. D. 2. . .	Chellis Bros., Plattsburg, N. Y.
Maple Grove Creamery, B.	Ellenburg Center, N. Y. . .	Maple Grove Cooperative Creamery Co.
Mooers Jet. Milk Sta.	Mooers Jet., N. Y.	Levy Dairy Co., New York City.
New England Creamery Co. M. S. .	Plattsburg, N. Y.	New England Creamery Co.
Peasliville Creamery, B. & C.	Plattsburg, N. Y.	Boomhower Grocery Co.
Peru Creamery, B. & C.	Peru, N. Y.	Peru Creamery Co.
Plattsburg Creamery, B. & C.	Plattsburg, N. Y.	Boomhower Grocery Co.
Riverview Creamery, B.	Champlain, N. Y.	Leon H. Wiley.
Robinson Creamery, Sk. Sta.	West Chazy, N. Y.	Silver Spring Creamery Co.
Rockdale Creamery, B.	Altona, N. Y.	Trombley Bros.
Rouses Point, M. S.	Rouses Point, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Saranac Valley Creamery, B.	Cadyville, R. F. D. 2. . .	Saranac Valley Cooperative Creamery Co.
Sciota Creamery, Sk. Sta.	Sciota, N. Y.	Silver Spring Creamery Co., West Chazy, N. Y.
Silver Spring Creamery, B.	West Chazy, N. Y.	Silver Spring Creamery Co.
Smithdale Creamery, C.	Plattsburg, N. Y.	Boomhower Grocery Co.
South Ellenburg Creamery	Ellenburg Center, N. Y. . .	J. C. Haig.
Valley Spring Creamery	Churubusco, N. Y.	Sheffield Farms, Slawson Decker Co., 524 West 57th st., New York City.
West Beekmantown Cream'y Assn. .	West Chazy, N. Y., R. F. D. 3.	West Beekmantown Creamery Association.
West Hill Cooperative Creamery ..	Chateaugay, N. Y.	West Hill Cooperative Creamery Co.
W. Plattsburg Creamery	Plattsburg, N. Y.	Boomhower Grocery Co.
Willow Beach.	Ellenburg Center, N. Y. . .	Willow Beach Cooperative Creamery Co.

COLUMBIA COUNTY

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Borden's M. S.	Ancram, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's M. S.	Ancram Lead Mines, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's M. S.	Chatham, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's M. S.	Copake, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's M. S.	Craryville, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's M. S.	Livingston, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's M. S.	Mellinville, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's M. S.	Old Chatham, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Cook's Siding, M. S.	Copake, N. Y.	Bryant & Chapman, Hartford, Conn.
Elizaville, M. S.	Pine Plains, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Harlemville, C.	Ghent, N. Y., R. F. D.	G. Savarese & Son, 386 Commercial st., Boston, Mass.
Homestead Farms Creamery, B.	Lebanon Center, N. Y.	A. S. & A. D. Haight.
North Chatham, M. S.	North Chatham, N. Y.	Locust Farms Co., 458 Tenth ave., New York City.
Savarese & Son, C.	East Chatham, N. Y.	G. Savarese & Son, 386 Commercial st., Boston, Mass.
S. F. S. D. Co., M. S.	Boston Corners, N. Y.	Sheffield Farms, Slawson Decker Co., 524 West 57th st., New York City.
S. F. S. D. Co., M. S.	Hillsdale, N. Y.	Sheffield Farms, Slawson Decker Co., 524 West 57th st., New York City.
Stuyvesant Falls, M. S.	Stuyvesant Falls, N. Y.	Locust Farms Co., 458 Tenth ave., New York City.
Valatie Creamery, M. S.	Valatie, N. Y.	Isaac La Monte & Son.

CORTLAND COUNTY

Blodgetts Mills, M. S.	Blodgetts Mills, N. Y.	Clover Farms, Inc., 534 West 48th st., New York City.
Blodgetts Mills-Greten, M. S.	Blodgetts Mills, N. Y.	Richard C. Greten, 214 Grand st., Hoboken, N. J.
Brookside, C.	Marathon, N. Y.	Conrad Bros.
Cincinnatus, Cond.	Cincinnatus, N. Y.	Cincinnatus Dairy Co.

CORTLAND COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Cincinnati, M. S.	Cincinnati, N. Y.	Reid Ice Cream Co., 524 Waverly ave., Brooklyn.
Cold Brook, Sk. Sta.	Willett, N. Y.	Cincinnati Dairy Co., Cincinnati, N. Y.
Cortland, M. S.	Cortland, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Cortland Co. Central, C.	Solon, N. Y.	Geo. F. Davis, McGraw, N. Y.
Cuyler, M. S.	Cuyler, N. Y.	Standard Dairy Co., 611 East 12th st., New York City.
East Freetown, M. S.	East Freetown, N. Y.	Beakes Dairy Co., 206 East 12th st., New York City.
East Homer—Levy, M. S.	East Homer, N. Y.	Levy Dairy Co., 19th st. and Avenue B, New York City.
East Homer—Rauch, M. S.	East Homer, N. Y.	Henry Rauch, 127 Garden st., Brooklyn.
East River, M. S.	East River, N. Y.	Model Dairy Co., 246 Eighth ave., New York City.
Ekenburg Co.	Cortland, N. Y.	The Ekenburg Co.
Freetown Cors., B. & C.	Marathon, N. Y.	High Ground Dairy Co., 447 Madison st., Brooklyn.
Gracie, M. S.	Cortland, N. Y., R. F. D.	Seiler Bros., 272 Plain st., Newark, N. J.
Harford, C. F.	Harford, N. Y.	John Blumers & Bros., 535 East 75th st., New York City.
Harford, M. S.	Harford, N. Y.	Standard Dairy Co., 611 East 12th st., New York City.
Harford Mills—Stevens, M. S.	Harford Mills, N. Y.	R. F. Stevens Co., 94 Third ave., Brooklyn.
Highland, B. & C.	Marathon, N. Y., R. F. D.	C. G. Stretch, Killawog, N. Y.
Homer, M. S.	Homer, N. Y.	Clover Farms, Inc., 534 West 48th st., New York City.
Hunts Corners, B. & C.	Marathon, N. Y., R. F. D.	C. G. Stretch, Killawog, N. Y.
Little York, M. S.	Little York, N. Y.	F. W. Janssen, 316 Garden st., Hoboken, N. J.
Marathon C.	Marathon, N. Y.	R. F. Stevens Co., 82 Third ave., Brooklyn.
Marathon, M. S.	Marathon, N. Y.	R. F. Stevens Co., 82 Third ave., Brooklyn.
Maybury's Mills, M. S.	McGraw, N. Y., R. F. D.	Otto Gruhn, 223 Borum st., Brooklyn.
McGraw, M. S.	McGraw, N. Y.	High Ground Dairy Co., 447 Madison st., Brooklyn.
Messengerville, M. S.	Messengerville, N. Y.	Hudson Milk & Cream Co., 170 Sixth st., Hoboken, N. J.
Preble—Clover Farms, M. S.	Preble, N. Y.	Clover Farms, Inc., 534 West 48th st., New York City.
Preble—Newark, M. S.	Preble, N. Y.	Newark Milk & Cream Co., 22 Bridge st., Newark, N. J.
Scott, C.	Scott, N. Y.	Clover Farms, Inc., 534 West 48th st., New York City.
Solon, M. S.	Solon, N. Y.	Clover Farms, Inc., 534 West 48th st., New York City.
Taylor Center, B. & C.	Cincinnati, N. Y., R. F. D.	A. H. Loop, Cincinnati, N. Y.

CORTLAND COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Taylor, C.	Taylor, N. Y.	Antonio Cueomo, 42 Spring st., New York City.
Taylor Valley, B. & C.	Cincinnatus, N. Y., R. F. D.	Dana White, Cincinnatus.
Texas Valley, B. & C.	Marathon, N. Y.	Cincinnatus Dairy Co., Cincinnatus, N. Y.
Truxton—Levy, M. S.	Truxton, N. Y.	Levy Dairy Co., 19th st. and Avenue B, Brooklyn.
Truxton—Sheffield, M. S.	Truxton, N. Y.	Sheffield Farms, Slawson Decker Co., 524 West 57th st., New York City.
Wightman's C.	Marathon, N. Y.	Homer Wightman.
Willett, B. & C.	Willett, N. Y.	Beardsley Cooperative Creamery Co.
Youngs Crossing, M. S.	Truxton, N. Y.	Otto Gruhn, 223 Borum st., Brooklyn.

DELAWARE COUNTY

Andes Creamery, M. S.	Andes, N. Y.	Andes Creamery Co., Inc.
Andes Cooperative Creamery, B.	Andes, N. Y.	Andes Cooperative Dairy Co., Inc.
Arena, M. S.	Arena, N. Y.	Andes Creamery Co., Inc.
Ayer & McKinney Creamery, B.	Arctic, N. Y.	Ayer & McKinney, Meridale, N. Y.
Ayer & McKinney Creamery, B.	Delhi, N. Y.	Ayer & McKinney, Meridale, N. Y.
Ayer & McKinney Creamery, B.	Elk Creek, N. Y.	Ayer & McKinney, Meridale, N. Y.
Ayer & McKinney Creamery, B.	Franklin, N. Y.	Ayer & McKinney, Meridale, N. Y.
Ayer & McKinney Creamery, B.	Hotaling Hollow, N. Y.	Ayer & McKinney, Meridale, N. Y.
Ayer & McKinney Creamery, B.	Leonta, N. Y.	Ayer & McKinney, Meridale, N. Y.
Ayer & McKinney Creamery, B.	Meridale, N. Y.	Ayer & McKinney, Meridale, N. Y.
Ayer & McKinney Creamery, B.	South Franklin, N. Y.	Ayer & McKinney, Meridale, N. Y.
Ayer & McKinney Creamery, B.	Treadwell, N. Y.	Ayer & McKinney, Meridale, N. Y.
Ayer & McKinney Creamery, B.	West Davenport, N. Y.	Ayer & McKinney, Meridale, N. Y.
Ayer & McKinney Creamery, B.	West Meredith, N. Y.	Ayer & McKinney, Meridale, N. Y.
Bordens, M. S.	Bloomville, N. Y.	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Bordens, M. S.	Delhi, N. Y.	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Bordens, M. S.	Downsville, N. Y.	Bordens Condensed Milk Co., 108 Hudson st., New York City.

DELAWARE COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Bordens, M. S.....	Hamden, N. Y.....	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Bordens, M. S.....	Pepacton, N. Y.....	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Bordens, M. S.....	Sidney Center, N. Y.....	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Bordens, M. S.....	Walton, N. Y.....	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Bordens, M. S.....	Youngs, N. Y.....	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Bovina Creamery, B.....	Bovina, N. Y.....	Bovina Cooperative Creamery Co., Inc.
Bovina Center Creamery, B.....	Bovina Center, N. Y.....	Bovina Center Cooperative Creamery Co., Inc.
Breakstone, M. S.....	Walton, N. Y.....	Breakstone Brothers, 344 Greenwich st., New York City.
Cannonsville Creamery, B.....	Cannonsville, N. Y.....	B. S. Boyd & Co.
Cohen, M. S.....	Stanford, N. Y.....	Cohen Dairy Co., 60 Lexington ave., New York City.
Colchester, M. S.....	Walton, N. Y.....	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Cold Spring Creamery, B.....	Roxbury, N. Y.....	Cold Spring Creamery Co., Inc.
Delaware Valley Creamery, B.....	Roxbury, N. Y.....	Delaware Valley Cooperative Creamery Co., Inc.
Delhi Creamery, B.....	Delhi, N. Y.....	Delhi Cooperative Dairy Co., Inc.
Downsville Creamery.....	Downsville, N. Y.....	Breakstone Brothers, 344 Greenwich, st., New York City.
Elgin of the Catskills Creamery, B.	Kelley's Corners, N. Y...	Elgin of the Catskills Cooperative Creamery Co., Inc.
E. L. K. Farms.....	Dunraven.....	Louis Kadans, 384 Greenwich st., New York City.
Elk Creek, Sk. Sta.....	Delhi, N. Y., R. F. D. 1.	Delhi Cooperative Dairy Co.
Empire State, M. S.....	East Meredith, N. Y.....	Empire State Dairy Co., 506 Broadway, Brooklyn.
Evans, M. S.....	Beerston, N. Y.....	W. M. Evans Dairy Co., 32 Lexington ave., Brooklyn.
Farmers Cooperative Dairy Co., B.	Trout Creek, N. Y.....	Farmers Cooperative Dairy Co.
Franklin Depot, M. S.....	Franklin Depot, N. Y.....	Beakes Dairy Co., 206 East 12th st., New York City.
Frazer Brothers, M. S.....	Frazer, N. Y.....	W. J. & H. R. Frazer.
Granton Creamery, B.....	Granton, N. Y.....	Granton Creamery Co., 84 Delaware st., Walton, N. Y.
Hancock, M. S.....	Hancock, N. Y.....	Charles H. Helmers.
Hamden Cooperative Creamery, B.	Hamden, N. Y.....	Hamden Cooperative Creamery Co.
Kortright Creamery, B.....	Bloomville, N. Y.....	Luke Blake, 99 Sixth ave., New York City.

DELAWARE COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Margaretsville, M. S.....	Margaretsville, N. Y.....	Hudson Valley Dairy Co., Newburgh, N. Y.
Masonville, M. S.....	Masonville, N. Y.....	Masonville Creamery Co.
Merrickville, M. S.....	Merrickville, N. Y.....	Beakes Dairy Co., 206 East 12th st., New York City.
Moore's Crossing, M. S.....	South Gilboa, N. Y.....	W. M. Evans Dairy Co., 32 Lexington ave., Brooklyn.
Mountainside, M. S.....	Shavertown, N. Y.....	Mountainside Dairy Co.
Mundale Creamery, B.....	Walton, N. Y.....	Mundale Creamery Co.
Mutual-McDermott, M. S.....	Delancey, N. Y.....	Mutual-McDermott Dairy Corporation, 214 East 22d st., New York City.
New Kingston Cooperative Creamery, B.....	New Kingston, N. Y.....	New Kingston Cooperative Creamery Co., Inc.
Ouleout Valley Creamery, B.....	Meridale, N. Y.....	Ouleout Valley Creamery Co., Delhi.
Ouleout Valley Creamery, B.....	North Franklin, N. Y.....	Ouleout Valley Creamery Co., Delhi.
Pepacton Creamery Co.....	Pepacton, N. Y.....	Breakstone Brothers, 344 Greenwich st., New York City.
Phoenix Cheese Co., C.....	Sidney, N. Y.....	L. E. Carpenter, 345 Greenwich st., New York City.
Pollis, C. F.....	De Lancey, N. Y.....	Pollis Brothers.
Sands Creek, M. S.....	Hancock, N. Y.....	Chas. H. Helmers.
Sheffield Farms, Slawson-Decker Co., Brookdale, M. S.....	Roxbury, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.....	Bloomville, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.....	Davenport, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.....	Davenport Center, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.....	East Davenport, N. Y....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.....	Grand Gorge, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.....	Halcottsville, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.....	Hale Eddy, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.

DELAWARE COUNTY — (Concluded)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Sheffield Farms, Slawson-Decker Co., M. S.	Hobart, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.	North Harpersfield, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.	Roxbury, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.	Stamford, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.	West Harpersfield, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
South Kortright, M. S.	South Kortright, N. Y. . .	T. O. Smiths Sons, New York City.
West Delhi, Sk. Sta.	Delhi, N. Y., R. F. D. 2. .	Delhi Cooperative Dairy Co.
West Hanson Brook Creamery. . .	Franklin, N. Y., R. F. D. 1	West Hanson Creamery Co., 84 Delaware st., Walton, N. Y.
West Kortright, M. S.	West Kortright, N. Y. . .	T. O. Smiths Sons, New York City.

DUTCHESS COUNTY

Billings, M. S.	Billings, N. Y.	Locust Farms Co., 458 Tenth ave., New York City.
Bordens, M. S.	Hopewell Junction N. Y. .	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Bordens, M. S.	Millerton, N. Y.	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Bordens, M. S.	Pine Plains, N. Y.	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Bordens, M. S.	Red Hook, N. Y.	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Bordens, M. S.	Stanfordville, N. Y.	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Bordens, M. S.	Wassaic, N. Y.	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Bordens, M. S.	Wingdale, N. Y.	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Briar Cliff Farms, M. S.	Pine Plains, N. Y.	Walter W. Law, Briar Cliff Manor, N. Y.

DUTCHESS COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Brinckerhoff, M. S.....	Brinckerhoff, N. Y.....	Hudson Valley Dairy Co., Newburgh, N. Y.
Clinton Corners, M. S.....	Clinton Corners, N. Y....	Beakes Dairy Co., 206 East 12th st., New York City.
Cooperative, M. B. & C.....	Poughkeepsie, N. Y.....	Farmers Cooperative Association.
Dover Plains, M. S.....	Dover Plains, N. Y.....	Mutual-McDermott Dairy Corporation, 127 West 42d st., New York City.
East Fishkill, M. S.....	Hopewell Junction, N. Y., R. F. D.....	Hudson Valley Dairy Co., Newburgh, N. Y.
Fishkill Plains, M. S.....	Hopewell Junction, N. Y., R. F. D.....	R. F. Stevens Co., 82 Third ave. Brooklyn.
Fitchett Brothers, M. S.....	Poughkeepsie, N. Y.....	Fitchett Brothers.
Green Haven, M. S.....	Stormville, N. Y., R. F. D.	Central Dairy Co., 326 East 103d st., New York City.
Holmes, M. S.....	Holmes, N. Y.....	Central Dairy Co., 326 East 103d st., New York City.
La Grange Creamery, B.....	Arlington, N. Y., R. F. D.	Henry R. Hoyt, 31 Market st., Poughkeepsie, N. Y.
La Grangeville, M. S.....	La Grangeville, N. Y.....	Beakes Dairy Co., 206 East 12th st., New York City.
Millbrook, Cond.....	Millbrook, N. Y.....	Mutual-McDermott Dairy Corporation, 127 West 42d st., New York City.
Mt. Riga, M. S.....	Millerton, N. Y., R. D....	Bryant & Chapman, Hartford, Conn.
Red Hook, M. S.....	Red Hook, N. Y.....	Beakes Dairy Co., 206 East 12th st., New York City.
Salt Point, M. S.....	Salt Point, N. Y.....	R. F. Stevens Co., 82 Third ave. Brooklyn.
Salt Point, B.....	Salt Point, N. Y.....	Salt Point Cooperative Assoc.
Sheffield Farms, Slawson-Decker Co., M. S.....	Amenia, N. Y.....	Sheffield Farms, Slawson-Decker Co., 542 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.....	Colemans Station, N. Y....	Sheffield Farms, Slawson-Decker Co., 542 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., Dover Furnace, M. S.....	Dover Plains, N. Y., R. F. D.....	Sheffield Farms, Slawson-Decker Co., 542 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.....	Pawling, N. Y.....	Sheffield Farms, Slawson-Decker Co., 542 West 57th st., New York City.
Shekomeko, M. S.....	Shekomeko, N. Y.....	Clover Farms, Inc., 534 West 48th st., New York City.
Silver Lake Cooperative, B.....	Clinton Corners, N. Y., R. F. D.....	Silver Lake Cooperative Creamery Association.

DUTCHESS COUNTY — (Concluded)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Stormville, M. S.	Stormville, N. Y.	Central Dairy Co., 326 East 103d st., New York City.
Verbank, M. S.	Verbank, N. Y.	Locust Farms Co., 458 Tenth ave., New York City.
Wappingers Falls, M. S.	Wappingers Falls, N. Y. .	Farmer's Cooperative Association, Poughkeepsie, N. Y.
Wappingers Falls, M. S.	Wappingers Falls, N. Y. .	Crowley Brothers.

ERIE COUNTY

Alden Creamery, M. S.	Alden.	Wheat Ice Cream Co., Buffalo.
Boston Creamery Association, B. & M. S.	Boston.	Howard Cobb.
Big Four No. 2, C.	Eden, N. Y., R. F. D. 3. .	C. J. Gaylord.
Brookside, C.	Collins Center.	John A. Vance, Lawtons, R. F. D.
Bordens, Cond.	Springville, N. Y.	Borden Condensed Milk Co., New York City.
Chaffee Creamery, M. S.	Chaffee, N. Y.	J. F. Wing.
Clarence Center, B.	Clarence Center, N. Y. .	E. & E. Weinauge, Clarence, N. Y.
Clarence, B.	Clarence, N. Y.	Edmund Weinauge & Son.
Colden Creamery, B. & M. S.	Colden, N. Y.	W. H. Rich Estate.
Collins Center, M. S.	Collins Center, N. Y.	Queen City Dairy Co., Buffalo.
Collins Center Cooperative Dairy Association, C.	Collins Center, N. Y.	Monroe Grimm.
Crittenden, Creamery, B.	Crittenden, N. Y.	Harry S. Smith.
Clarence No. 2, B.	South Newstead, N. Y. .	Edmund Weinauge & Son, Clarence.
Colden Center, M. S.	Glenwood, N. Y.	Richardson-Beebe Co., East Aurora.
Clover Leaf, C.	North Collins, N. Y., R. F. D. 1.	Joseph Bantle.
Clover Leaf Dairy.	Buffalo, N. Y.	R. & J. Burney, 18 Fifteenth st.
Dye, C.	Springville, N. Y., R. F. D.	Earl Johnson, North Boston.
Erie No. 1, C.	Collins, N. Y.	F. A. Brigham.
East Concord, C.	East Concord, N. Y.	Fred W. Domes.
East Holland, C.	Holland, N. Y., R. F. D.	Richardson-Beebe Co., East Aurora.
Farmer's Favorite, C.	North Collins, N. Y., R. F. D. 1.	Peter Sheets.
Forks, C.	Sardinia, R. F. D. 1.	E. L. Jones, Delevan.
Grade A Creamery, M. S.	Jamison Road, N. Y.	Charles Zapf.
Hasselback No. 2, C.	Derby, N. Y., R. F. D. .	Hasselback Cheese Co., Buffalo.
Hasselback No. 13, C.	Springville, N. Y., R. F. D.	Hasselback Cheese Co., Buffalo.
Hasselback No. 18, C.	Marilla, N. Y., R. F. D. .	Hasselback Cheese Co., Buffalo.
Hakes Bridge, C.	Sardinia, N. Y., R. F. D.	E. L. Jones, Delevan.
Hayes Hollow, C.	Glenwood, N. Y., R. F. D.	Jacob Imboden.
Holland, B.	Holland, N. Y.	Richardson-Beebe Co., East Aurora.
Marshfield No. 1, C.	Lawtons, N. Y., R. F. D.	John A. Vance.
Marshfield No. 2, C.	Lawtons, N. Y., R. F. D.	John A. Vance.
Marilla No. 1, M. S. & Sk. Sta. .	Marilla, N. Y.	Adams & Shearing Dairy Co.
Millgrove, B.	Millgrove, N. Y.	Godfrey Enkerly.
Maple Creamery, B.	Akron, N. Y., R. F. D. .	William Barre.
New Oregon, C.	Springville, N. Y., R. F. D.	J. A. Vance, Lawtons, R. F. D.

ERIE COUNTY — (Concluded)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
North Boston, C.	North Boston, N. Y.	Earl Johnson.
Peerless Creamery, Cond.	Akron, N. Y.	Wheat Ice Cream Co., Buffalo.
Pontiac, C.	Angola, N. Y., R. F. D.	Sebastian Lograsso.
Prairie Queen, C.	Collin Center, N. Y.	Clark White & Son.
Perrin Brook, C.	Gowanda, N. Y., R. F. D.	Merrit Bull.
Protection, Sk. Sta.	Protection, N. Y.	Richardson-Beebe Co., East Aurora.
Pine Brook, C.	Gowanda, N. Y., R. F. D.	I. A. M. Skuse.
Porterville, No. 2, Sk. Sta.	Porterville, N. Y.	Adams & Shearing Dairy Co., Marilla.
Queen City, Sk. Sta.	East Aurora, N. Y.	Queen City Dairy Co., Buffalo.
Queen City No. 4, M. S.	Lawtons, N. Y.	Queen City Dairy Co., Buffalo.
Sardinia, C.	Sardinia, N. Y.	E. L. Jones, Delevan.
South Colden, Sk. Sta.	Glenwood, N. Y. R. F. D.	Richardson-Beebe Co., East Aurora.
South Wales, Sk. Sta.	South Wales, N. Y.	Richardson-Beebe Co., East Aurora.
Wales Center, Cond., B.	Wales Center, N. Y.	Richardson-Beebe Co., East Aurora.
West Hill, Sk. Sta.	Holland, N. Y., R. F. D.	Richardson-Beebe Co., East Aurora.
West Boston, C.	Eden, N. Y., R. F. D.	Robert Fuller.
Wohlhueter, C.	Colden, N. Y., R. F. D.	George Wohlhueter.
Woodside, C.	Springville, N. Y., R. F. D. 13.	Edwin H. Russell.
Wyandale, C.	Springville, N. Y., R. F. D. 2.	William G. Fatty.
Zoar, C.	Gowanda, N. Y., R. F. D.	Charles Grimm.

ESSEX COUNTY

Adirondack Creamery, B.	Whallonsburg, N. Y.	Adirondack Creamery Co.
Essex Cooperative Creamery.	Boquet, N. Y.	G. H. Kelley, Essex, N. Y.
Farmers Cooperative Creamery.	Crown Point, N. Y.	W. S. Green.
Jay Creamery.	Jay, N. Y.	F. R. Wilmarth.
Westport Creamery.	Westport, R. F. D., N. Y.	J. H. Low.

FRANKLIN COUNTY

Adirondack Creamery, M. & B.	Bangor, N. Y.	Norman Wilson, Skerry, N. Y.
Alburgh Creamery, B.	Brushton, N. Y.	S. P. & W. B. Knapp.
Alder Spring Creamery, B.	Chateaugay, N. Y.	J. E. Leach.
Belmont Center Creamery, B.	Malone, N. Y. R. F. D.	Reynolds & Chase, Brainardsville, N. Y.
Brookside Creamery, B.	Moir, R. F. D., N. Y.	C. F. Tryon.
Brushton Creamery, B.	Brushton, N. Y.	F. L. Richards.
Brushton, M. S.	Brushton, N. Y.	Teitjen Bros., 506 East 118th st., New York City.
Burke, M. S.	Burke, N. Y.	Mutual McDermott Dairy Co., New York City.
Burnap Creamery, B.	Brushton, R. F. D. 1, N. Y.	Edward Burnett.
Chateaugay, B.	Chateaugay, N. Y.	Chateaugay Cooperative Creamery Association.
Chateaugay, M. S.	Chateaugay, N. Y.	Sheffield Farms, Slawson Decker Co., New York City.
Clover Leaf Creamery Co., B.	North Bangor, N. Y.	F. M. Aldrich.
Cold Spring Creamery, B.	West Bangor, N. Y.	Barber & Fish.
Columbia Creamery Co., C.	Burke.	Mutual McDermott Dairy Co., New York City.

FRANKLIN COUNTY — (Concluded)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Constable Creamery, B.....	Constable, N. Y.....	Wm. Stebbins.
Constable, M. S.....	Constable, N. Y.....	Sheffield Farms, Slawson-Decker Co., New York City.
Crystal Spring Creamery, M. S....	Constable, R. F. D., N. Y.	Franklin County Creamery & Condensed Milk Co., North Bangor, N. Y.
Drum, Sk. Sta.....	Fort Covington, N. Y....	Fort Covington Cooperative Creamery Co.
East Dickinson Creamery, B.....	Brushton, N. Y.....	Sandy Ross.
Fay Creamery, B.....	Burke, N. Y.....	A. H. Fay.
Fort Covington Condensary, B....	Ft. Covington, N. Y.....	Franklin County Creamery & Condensed Milk Co., North Bangor, N. Y.
Franklin County Creamery & Cond. Milk Co.....	North Bangor, N. Y.....	Franklin County Creamery & Condensed Milk Co.
Gilt Edge Creamery, B.....	Moirs, N. Y.....	Stiles & Erwin.
Gold Coin Creamery, M. S.....	Ft. Covington, N. Y.....	Northern Creamery Co., Madrid, N. Y.
Grow, Sk. Sta.....	Bombay, N. Y.....	Franklin County Creamery & Condensed Milk Co., North Bangor, N. Y.
Harwood Creamery, M. S.....	Brushton, N. Y.....	Franklin County Creamery & Condensed Milk Co., North Bangor, N. Y.
Hutchinson, Sk. Sta.....	North Bangor, R. F. D., N. Y.....	Frank B. Allen, Longmeadow, Mass.
Keeler Creamery, B.....	Malone, N. Y.....	T. J. Shields.
Malone Creamery, B.....	Malone, N. Y.....	K. H. Walbridge.
Malone, M. S.....	Malone, N. Y.....	Sheffield Farms, Slawson-Decker Co., New York City.
Maple Creamery, B.....	Moirs, N. Y.....	Jas. O'Connor.
Maple Leaf Creamery, B.....	Bangor, N. Y.....	G. C. & C. E. Walker, North Bangor, N. Y.
Maple Street Creamery, B.....	Chateaugay, N. Y., R. D. 1.....	Wills Bros., Chateaugay, N. Y.
Moirs, M. S.....	Moirs, N. Y.....	Levy Dairy Co., New York City.
Mountain Creamery, B.....	Chasm Falls, N. Y.....	U. W. Killam.
Mountain, Sk. Sta.....	Whippleville, N. Y.....	U. W. Killam.
Silver Spring Creamery, B.....	Brushton, N. Y., R. D. 2.	F. L. Richards, Brushton, N. Y.
Skerry Creamery, B.....	Skerry, N. Y.....	Norman Wilson.
Springdale Creamery, B.....	Dickinson Center, N. Y....	Henry La May.
Springfield Creamery.....	South Bangor, N. Y.....	Frank B. Allen, Longmeadow, Mass.
St. Lawrence Valley Creamery....	Bombay, N. Y.....	Franklin County Creamery & Condensed Milk Co., North Bangor, N. Y.
St. Regis River Creamery, B.....	Hogansburg, N. Y.....	E. H. Totman.
Trout River Creamery, B.....	Trout River, N. Y.....	Franklin County Creamery & Condensed Milk Co., North Bangor, N. Y.
West Blemont Creamery, B.....	Malone, N. Y.....	J. M. Hapgood.
Westville Center Creamery, B.....	Westville Center, N. Y....	Franklin County Creamery & Condensed Milk Co., North Bangor, N. Y.

FULTON COUNTY

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Crown Creamery.....	Johnstown, N. Y.....	Beck & Saltsman.
Eagle Creamery.....	Gloversville, N. Y.....	E. W. Mills, 145 No. Main st.
Empire Creamery.....	Gloversville, N. Y.....	Wm. Rockwell, 81 East Ful-ton st.
Ephratah, C.....	Ephratah, N. Y.....	Norman Getman, Johnstown, N. Y.
Fulton County Milk Co., B.....	Johnstown, N. Y.....	Rupert & Gross, 8 Water st.
Lenz Creamery.....	Gloversville, N. Y.....	W. H. Lenz.
Sammons ville, C.	Johnstown R. F. D. 2, N. Y.....	Byron Martin.
Whitlock, C.....	St. Johnsville, R. F. D., N. Y.....	Ira Whitlock.
Willow Creek, C.....	Ephratah, N. Y.....	A. C. Richard.

GENESEE COUNTY

Beechnut Creamery, B. & C.....	Le Roy.....	J. F. Hager.
Byron Creamery, B.....	Byron.....	A. G. Steele.
Fargo Dairy, M. S.....	Batavia.....	Warren Fargo, 206 Main st.
Hygenic Dairy, M. S.....	Batavia, R. F. D.....	Augustus Branton.
Indian Falls, B.....	Indian Falls.....	Samuel Schlegern.
Pavillion, B.....	Pavillion.....	F. M. Van Buren.

GREENE COUNTY

Ashland Creamery, M. S.....	Ashland, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Farmers' Creamery Co.....	East Durham, N. Y.....	Farmers' Cooperative Creamery Co.
Halcott Center Creamery, B.....	Halcott Center, N. Y.....	Halcott Center Creamery Co., Walton.
Hensonville Cooperative Creamery, B.....	Hensonville, N. Y.....	Windham Elgin Creamery Co. Windham.
Hunter Creamery.....	Hunter, N. Y.....	Max Blum, 146 Reade st., New York City.
Lexington Creamery, M. S.....	Lexington, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Locust Grove Creamery, B.....	Oak Hill, N. Y.....	Locust Grove Creamery Co.
Prattsville Dairy Co., B.....	Prattsville, N. Y.....	Prattsville Dairy Co.
Prattsville Creamery, M. S.....	Prattsville, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Windham Elgin Creamery, B.....	Windham, N. Y.....	Windham Elgin Creamery Co.

HERKIMER COUNTY

Barto Hill, C.....	Little Falls, R. F. D.....	W. M. Ford.
B. & H. Cheese Factory.....	Mohawk, N. Y.....	Charles Shout.
Borden's Condensed Milk Co., M. S.....	Frankfort, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York city.

HERKIMER COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Borden's Condensed Milk Co., M. S.....	Newport, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Burt Grove, C.....	Herkimer, R. F. D. 1, N. Y.....	Ward Wakeman.
Bush, C.....	Mohawk, R. F. D. 2, N. Y.	L. Springer.
Carpenter, C.....	Poland, R. F. D. 1, N. Y.	E. W. Coon, Philadelphia, Pa.
Cave, Samuel, C.....	Cold Brook, R. F. D. 1, N. Y.....	Jas. P. Nellis.
Cedarville, M. S.....	West Winfield, N. Y.....	Levy Dairy Co., New York City.
Cedarville Milk and Cream Co....	Cedarville, N. Y.....	Phenix Cheese Co., 345-7 Green- wich st., New York City.
Cold Brook, C.....	Cold Brook, N. Y.....	F. D. Fox.
Cold Creek, C.....	Dolgeville, N. Y., R. F. D.	Isaac Fox.
Cold Spring Dairy Products Co., C.	Mohawk, N. Y.....	Cold Spring Dairy Products Co.
Cramers Corners Cheese Factory Association.....	Fort Plain, R. F. D.....	Cramers Corners Factory Asso- ciation.
Crystal Spring, B.....	Herkimer, N. Y.....	Wm. McKerron.
Cullen, C.....	Richfield Springs, R. F. D. 2.....	C. Garline.
Deck, C.....	Mohawk, R. F. D. 3.....	John D. Cramer.
Dickers Dairy, C.....	Cold Brook, R. F. D. 1.....	Mrs. C. M. Dicker.
Dolgeville, M. S.....	Dolgeville, N. Y.....	Empire State Dairy Co., New York City.
East Winfield, M. S.....	West Winfield, R. F. D.....	Standard Dairy Co., 611-612 East 12th st., New York City.
Eatonville, C.....	Little Falls, N. Y.....	W. J. Eaton.
Fairfield Dairy Association, C.....	Little Falls, N. Y.....	T. Atkins.
Fisher, F. J., C.....	Cold Brook, R. F. D. 1.....	F. J. Fisher.
Gravesville, M. S.....	Gravesville, N. Y.....	Max Blum 146 Reade st., New York City.
Ingham, M. S.....	Little Falls, N. Y., R. F. D.....	Empire State Dairy Co., New York City.
International Milk Products Co., M. S.....	Middleville, N. Y.....	International Milk Products Co., Cooperstown, N. Y.
Jacksonburg, M. S.....	Mohawk, N. Y.....	Clover Farms, 534-536 West 48th st., New York City.
Jordanville Milk & Cream Co....	Jordanville, N. Y.....	Jordanville Milk & Cream Co.
Kast Bridge, M. S.....	Herkimer, R. F. D. 2.....	T. O. Smith's Sons.
Keller, A., C.....	Little Falls, N. Y.....	Willard Keller.
Keystone Dairy, M. S.....	West Winfield, N. Y.....	Keystone Dairy Co., 622 Madi- son st., Hoboken, N. J.
Lints, S. P., C.....	Frankfort, R. F. D. 1.....	S. P. Lints.
Litchfield Milk Co., Inc.....	Ilion, N. Y.....	Litchfield Milk Co., Inc., 115 115 Genesee st., Utica, N. Y.
Little Falls Dairy.....	Little Falls, N. Y.....	Modern Dairy Co., 609 West 49th st., New York City.
Little Falls, M. S. (Farmers).....	Little Falls, N. Y.....	Little Falls Dairy Co.

HERKIMER COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Little Falls, C.....	Little Falls, N. Y.....	T. Atkins.
Little Falls, M. S.....	Little Falls, N. Y.....	Levy Dairy Co., 19th st. and avenue B, New York City.
D. McArthur, C.....	Cold Brook, N. Y.....	D. McArthur.
McCredy, Sta. 9.....	Mohawk, N. Y.....	Willowbrook Dairy Co., New York, N. Y.
McKoons Crossing, M. S.....	Richfield Springs, R. F. D. 4.....	Brooklyn Milk Co., 262 Bond st., Brooklyn, N. Y.
Mace Creamery, M. S.....	Ilion, N. Y.....	Ralph Mace.
Middleville, M. S.....	Middleville, N. Y.....	Levy Dairy Co., New York City.
Millers Mills, M. S.....	Millers Mills, N. Y.....	Modern Dairy Co., Newark, N. Y.
Mound Creek, C.....	Cold Brook, N. Y., R. F. D. 1.....	Eugene Hemstreet.
Murphy's Home Dairy, C.....	Salisbury, N. Y.....	C. H. Murphy.
Newport, M. S.....	Newport, N. Y.....	Modern Dairy Co., 609 West 49th st., New York City.
North Litchfield, M. S.....	North Litchfield, N. Y....	Newark Milk & Cream Co., Newark, N. J.
North Norway, C.....	Gray, N. Y.....	Sylvester Stanley.
North Winfield, M. S.....	West Winfield, R. F. D....	Newark Milk & Cream Co., Newark, N. J.
Old Manheim, C.....	Little Falls, N. Y. R. F. D.....	Old Manheim Cheese Association.
O'Ryan Home Dairy, C.....	Little Falls, N. Y., R. F. D.....	Daniel O'Ryan.
Old Salisbury, C.....	Little Falls, N. Y.....	M. C. Burrell, South st., Utica, N. Y.
Poland M. S.....	Poland, N. Y.....	J. E. Rosasco, 13 Morton st., New York City.
Putnam & DeVere Creamery, M. S.....	Herkimer, N. Y.....	Putnam & DeVere, Herkimer, N. Y.
Ransom, C. W., C.....	Little Falls, N. Y., R. F. D. 2.....	C. W. Ransom, Little Falls, N. Y.
Schuyler Centennial, C.....	Frankfort, N. Y., R. F. D. 1.....	Elmer Farrington.
Schuyler Junction, M. S.....	Frankfort, N. Y.....	Alex. Campbell Milk Co., 802 Fulton St., Brooklyn, N. Y.
Shells Bush, C.....	Herkimer, N. Y., R. F. D.	Samuel Gordon, Herkimer, N. Y.
Snyder Brothers Home Dairy.....	Cold Brook, N. Y., R. F. D. 1.....	Henry Snyder.
South Columbia, M. S.....	Richfield Springs, N. Y....	F. N. Bunger, Newark, N. J.
Starkville, Sk. Sta.....	Fort Plain, N. Y., R. F. D.....	Fort Plain Dairy Kitchen.
Van Hornesville, C.....	Van Hornesville, N. Y....	Van Hornesville Cheese & Milk Products Association, Inc.
West Winfield, M. S.....	West Winfield, N. Y....	Bordens Condensed Milk Co., New York City.

JEFFERSON COUNTY

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Adams Center, M. S.	Adams, N. Y.	Libby, McNeil & Libby, Chicago, Ill.
Antwerp Factory, B. & C.	Antwerp, N. Y.	F. X. Baumert & Co.
Atwood, C.	Depauville, N. Y.	Jacob Vogt, Watertown, N. Y.
Bacon, C.	Theresa, N. Y.	J. Vock & Son.
Baltz Factory, C.	Lafargeville, N. Y.	Henry Leonhardt, Alexandria Bay, N. Y.
Bay View, C.	Dexter, N. Y.	B. B. Fairchild.
Beckwith, C.	Fine View.	W. G. Beckwith.
Bellville Dairy Co.	Bellville, N. Y.	Bellville Dairy Co.
A. Bickelhaupt, No. 2 Factory ...	Redwood, N. Y.	A. Bickelhaupt.
A. Bickelhaupt, No. 3 Factory ...	Lafargeville, N. Y.	A. Bickelhaupt, Redwood, N. Y.
A. Bickelhaupt, No. 5 Factory ...	Theresa.	A. Bickelhaupt, Redwood, N. Y.
A. Bickelhaupt, No. 7 Factory ...	Theresa.	A. Bickelhaupt, Redwood, N. Y.
A. Bickelhaupt, No. 8 Factory ...	Redwood.	A. Bickelhaupt.
A. Bickelhaupt, No. 9 Factory ...	Redwood, R. F. D.	A. Bickelhaupt, Redwood, N. Y.
A. Bickelhaupt, No. 10 Factory ...	Theresa.	A. Bickelhaupt, Redwood, N. Y.
A. Bickelhaupt, No. 12 Factory ...	Redwood.	A. Bickelhaupt.
A. Bickelhaupt, No. 13 Factory ...	Clayton, R. F. D.	A. Bickelhaupt, Redwood, N. Y.
A. Bickelhaupt, No. 15 Factory ...	Lafargeville, R. F. D.	A. Bickelhaupt, Redwood, N. Y.
A. Bickelhaupt, No. 16 Factory ...	Lafargeville, R. F. D.	A. Bickelhaupt, Redwood, N. Y.
A. Bickelhaupt, No. 18 Factory ...	Clayton, R. F. D.	A. Bickelhaupt, Redwood, N. Y.
A. Bickelhaupt, No. 20 Factory ...	Clayton, R. F. D.	A. Bickelhaupt, Redwood, N. Y.
A. Bickelhaupt, No. 21 Factory ...	Clayton, R. F. D.	A. Bickelhaupt, Redwood, N. Y.
A. Bickelhaupt, No. 22 Factory ...	Redwood, N. Y.	A. Bickelhaupt.
A. Bickelhaupt, No. 23 Factory ...	Clayton, N. Y., R. F. D.	A. Bickelhaupt, Redwood, N. Y.
Black River, M. S.	Black River, N. Y.	Frank F. Hatch, 105 West 46th st., New York City.
Brookside, C.	Watertown, R. F. D.	Jacob Davis, Rodman, N. Y.
Brownsville, M. S.	Brownsville, N. Y.	Ullman & Hauk, New York City.
Buckminster Factory, C.	Watertown, R. F. D.	Jacob Vogt, Watertown, N. Y.
Camp's Mills, M. S.	Sackett's Harbor.	Ullman & Hauk, New York City.
Carthage, M. S.	Carthage, N. Y.	Bordens Condensed Milk Co., New York City.
Cascade, B. & C.	Watertown, N. Y., R. F. D. 2.	V. H. Peck.
Champion Village, C.	Carthage, N. Y.	Tooley & Wiley.
Chapel Corners, C.	Theresa, N. Y., R. F. D.	C. C. Dugan, Redwood, N. Y.
Chaumont, M. S.	Chaumont, N. Y.	Ullman & Hauk, New York City.
Clayton, M. S.	Clayton, N. Y.	Ullman & Hauk, New York City.
Cold Brook, B. & C.	Lafargeville, N. Y., R. F. D.	L. J. Goodison.
Cold Spring, B. & C.	Redwood, N. Y.	Edwin Putman.
Crystal Spring Creamery, C.	Adams, N. Y.	E. W. Coon, Philadelphia, Pa.
Dexter, C.	Dexter, N. Y.	Dexter Dairy Co.
Diamond, C.	Mannsville, N. Y.	H. A. Roberts.
Dixon, C.	Antwerp, N. Y.	F. X. Baumert & Co.
Douglas, C.	Theresa, N. Y.	Douglas Estate.
Eames, C.	Watertown, N. Y.	Henry Eames.
East Antwerp, C.	Antwerp, N. Y.	Elmer Swem.
East Rodman, C.	East Rodman, N. Y.	Richard Mills, Watertown, N. Y.
Ellisburg, B. & C.	Ellisburg, N. Y.	Jefferson Co. Creamery Co., 100 Hudson st., New York City.
Eureka, B. & C.	Sackett's Harbor.	S. A. Hall, Watertown, N. Y.

JEFFERSON COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Evans Mills, C.....	Evans Mills, N. Y.....	F. X. Baumert & Co., Antwerp, New York
Excelsior, C.....	Limerick, N. Y., R. F. D. 2	John Dietrich.
Fair View, C.....	Watertown, R. F. D.....	Fair View Cheese Co.
Farmers, B. & C.....	Depauville, N. Y.....	B. B. Miller & Son, Lowville, N. Y.
Flat Rock, C.....	Plessis, N. Y.....	Amity Dairy Co., New York City
Fox Creek, C.....	Cape Vincent, N. Y.....	B. W. Hentze, Three Mile Bay, N. Y.
Galloway St., C.....	Philadelphia, N. Y.....	Frank Hoover & Son, Sterlingville, N. Y.
Gates, C.....	Lafargeville, N. Y.....	Jacob Vogt, Watertown, N. Y.
Gould, C.....	Evans Mills, N. Y.....	F. X. Baumert & Co., Antwerp, N. Y.
Great Bend, M. S.....	Great Bend, N. Y.....	Locust Farms Dairy Co., 458 Tenth ave., New York City.
Grenadier Island, C.....	Cape Vincent, N. Y.....	John D. Fitzgerald.
Grindstone Island, C.....	Clayton, N. Y.....	Grindstone Island Cheese Ass'n.
Haas, C.....	Depauville, N. Y.....	Jacob Vogt, Watertown, N. Y.
Hadsell & Orvis, C.....	Felts Mills, N. Y.....	Hadsell & Orvis, Black River, N. Y.
Halls Corners, C.....	Philadelphia, N. Y.....	F. X. Baumert & Co., Antwerp, N. Y.
Henderson Village, B. & C.....	Henderson, N. Y.....	Henderson Butter & Cheese Ass'n., Adams, N. Y., R. F. D. 3.
Hill Spring, C.....	Omar, N. Y.....	Chris. Gray.
Hillside Factory, C.....	Philadelphia, N. Y.....	F. X. Baumert & Co., Antwerp, N. Y.
Holmes Factory, C.....	Theresa, N. Y.....	J. Vock & Son.
Hoover C.....	Sterlingville.....	Frank Hoover & Son.
Hyde Creek, C.....	Theresa, N. Y.....	Hyde Creek Cheese Factory.
Indian River, C.....	Carthage, N. Y., R. F. D. 2.....	F. X. Baumert & Co., Antwerp, N. Y.
Jefferson Valley, C.....	Theresa, R. F. D.....	F. X. Baumert & Co., Antwerp, N. Y.
Keens, M. S.....	Hailsboro, N. Y.....	Bordens Condensed Milk Co., New York City
Kelsey Bridge Factory, C.....	Philadelphia, N. Y.....	J. Vock & Son, Theresa, N. Y.
Keystone Milk Products Co., C.....	Carthage, N. Y.....	Keystone Milk Products Co.
Lafargeville, M. S.....	Lafargeville, N. Y.....	Ullman & Hauk, New York City.
Lake View Factory, C.....	Evans Mills, N. Y.....	J. Vock & Son, Theresa, N. Y.
Lambert Walters Factory, C.....	Watertown, N. Y., R. F. D.....	Jacob Vogt, Watertown, N. Y.
Leonhardt, C.....	Alexandria Bay, N. Y.....	Henry Leonhardt, Redwood, N. Y.
Line Road, C.....	Clayton, N. Y.....	Line Road Cheese Factory
Lorraine, B. & C.....	Lorraine, N. Y.....	Lorraine Milk & Cream Co.
Mannsville, B. & C.....	Mannsville, N. Y.....	Jefferson Co. Creamery Co., 100 Hudson st., New York City.
Mannsville Dairymen's Cooperative Assoc., M. S. & C.....	Mannsville, N. Y.....	Mannsville Dairymen's Cooperative Assoc.

JEFFERSON COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Mannsville, M. S.	Mannsville, N. Y.	J. H. Mullar, 130 West 61st st. New York City.
Maple Grove, B. & C.	Mannsville, N. Y.	E. G. Rudd.
Mellins Bay, C.	Cape Vincent, N. Y.	Mellins Bay Cheese Factory.
Merriman, C.	Black River, N. Y.	W. E. Gracey.
New Connecticut Factory, C.	Theresa, N. Y., R. F. D.	Earl B. Storey.
New Model, B. & C.	Henderson, N. Y.	New Model Dairy Products Co.
North Rodman, C.	Adams Center, N. Y.	North Rodman Cheese Factory.
Old Maple Grove, C.	Adams, N. Y., R. F. D.	Geo. W. Lalone.
Ontario, B. & C.	Sacketts Harbor, N. Y.	W. C. Kelsey.
Orleans Center, C.	Lafargeville, N. Y.	James C. Haggart.
Orleans Corners, M. S.	Orleans Corners, N. Y.	Ullman & Hauk, New York City
Orleans Valley, C.	Theresa, N. Y.	Orleans Valley Cheese Co.
Pamelia, C.	Evans Mills, N. Y.	F. X. Baumert & Co., Antwerp, N. Y.
Pamelia Center, C.	Watertown, N. Y., R. F. D. 4	Pamelia Center Cheese Co.
Patrons, C.	Brownsville, N. Y.	Patrons Cheese Co.
Perry, C.	Limerick, N. Y.	L. F. Perry.
Philadelphia, C.	Philadelphia, N. Y.	H. Arnstein, New York City.
Philadelphia, M. S.	Philadelphia, N. Y.	H. Arnstein, New York City.
Pierrepont Manor, M. S.	Pierrepont Manor, N. Y.	Wm. Slottman, 23 Margin st., New York City.
Pillar Point Central, C.	Dexter, N. Y.	C. C. Mearns.
Pillar Point Union, C.	Limerick, R. F. D. 1	Brayton Adams.
Pleasant Valley, C.	Cape Vincent, N. Y.	Pleasant Valley Cheese Co.
Point Peninsula	Point Peninsula, N. Y.	Point Peninsula Cheese Co.
Pool Factory, C.	Theresa, N. Y.	J. Vock & Son.
Redwood, M. S.	Redwood, N. Y.	Amity Dairy Co., New York City.
Reynolds Corners, C.	Chaumont, N. Y.	Jacob Vogt, Watertown, N. Y.
Rices, M. S.	Rices, N. Y.	Modern Dairy Co., 649 49th st., New York City.
Riverside, C.	Ox Bow, N. Y.	Beanfield & Storin.
Rock Brook, C.	Evans Mills, N. Y.	F. X. Baumert & Co., Antwerp, N. Y.
Rocky Ledge, C.	Evans Mills.	F. X. Baumert & Co., Antwerp, N. Y.
Rodman Village, B. & C.	Rodman, N. Y.	Jacob Davis & Son.
Rosemary Creamery Co., B.	Adams, N. Y.	Rosemary Creamery Co., 11 Pine st., New York City.
Rosemary Creamery Co., M. S.	Smithville, N. Y.	Rosemary Creamery Co., 11 Pine st., New York City.
Rosiere, C.	Rosiere, N. Y.	Rosiere Cheese Co.
Rosiere, M. S.	Rosiere, N. Y.	Ullman & Hawk, New York City
Sandy Creek Valley, B. & C.	Rodman, N. Y.	O. N. Heath.
Scotch Brook Factory, C.	Cape Vincent, N. Y.	Scotch Brook Cheese Co.
Seoville Corners Factory, C.	Watertown, R. F. D.	Jacob Vogt, Watertown, N. Y.
Shurtleff, M. S.	Philadelphia, N. Y.	Model Dairy Co., New York City.
Silver Creek, C.	Rodman, R. F. D.	Jacob Davis & Son.
Snell Factory, C.	Lafargeville, N. Y.	Henry Leonhardt, Alexandria Bay, N. Y.
South Champion, B. & C.	Copenhagen, N. Y.	H. L. Grant.

JEFFERSON COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Smithville Dairy Co., C.	Smithville, N. Y.	Smithville Dairy Co.
Sprague Factory, C.	Theresa, N. Y.	J. Vock & Son.
Spring, C.	Philadelphia, N. Y.	Glen Fuller, Theresa, N. Y.
Springer, C.	Redwood, N. Y.	Hiram Haford, Theresa, N. Y.
Star Brook, C.	Barnes Corners, N. Y.	P. Pettingill.
Sterlingville, M. S.	Sterlingville, N. Y.	Bordens Condensed Milk Co., New York City.
Stewart, C.	Evans Mills, N. Y.	F. X. Baumert & Co., Antwerp, N. Y.
Still, C.	Theresa, N. Y.	J. Vock & Son.
Stone Factory, C.	Theresa, N. Y.	J. Vock & Son.
Stone Mills, C.	Lafargeville, N. Y.	Stone Mills Union Cheese Co.
Sunny Side, C.	Evans Mills, N. Y.	F. X. Baumert & Co., Antwerp, N. Y.
Theresa, M. S.	Theresa, N. Y.	Central Dairy Co., New York City.
1000 Island, B. & C.	Alexandria Bay, N. Y.	Archie Scott.
1000 Island, C.	Clayton, N. Y.	E. W. Coon, Philadelphia, Pa.
Three-Mile Bay, B. & C.	Three Mile Bay, N. Y.	D. B. Mount.
Tylerville, B. & C.	Copenhagen, R. F. D. 3.	J. Goodrich.
Vogt Factory, C.	Watertown, N. Y.	Jacob Vogt.
Vogt Factory, C.	Lafargeville, N. Y.	Jacob Vogt, Watertown, N. Y.
Warren Settlement, C.	Rosiere, N. Y.	Geo. H. Cornaire.
Watertown Valley, C.	Burns Mills, N. Y.	Lafayette Polly, Watertown, N. Y.
West Carthage, C.	Carthage, N. Y.	Charles E. Besha.
Wheeler, C.	Theresa, N. Y.	J. Vock & Son.
Williams, No. 2, C.	Watertown, R. F. D. 2.	Max Staeckel, Watertown, R. F. D. 1.
Wilna Center, C.	Carthage, N. Y.	Jerome Pierce.
Wilna Farms, B. & C.	Carthage, N. Y.	Vickler & Carter.
Wilson Bay, C.	Cape Vincent, N. Y., R. F. D.	Wilson Bay Cheese Co.
Wilson, C.	Philadelphia, N. Y.	Clark & Allen.
Windmill, C.	Watertown, N. Y.	B. McMullen.
Winona, C.	Mannsville, N. Y.	Winona Milk Co.
Woodville, B. & C.	Woodville, N. Y.	Jefferson County Creamery Co., 100 Hudson st., New York City.
Woolworth, C.	Copenhagen, N. Y.	Mrs. S. A. Woolworth.
Worth Center, B. & C.	Adams, N. Y., R. F. D.	J. M. O'Connor.
Worthville, B. & C.	Worthville, N. Y.	Worthville Butter, Cheese & Cream Co.
Yorst, B. & C.	Antwerp, N. Y.	F. X. Baumert & Co.

KINGS COUNTY

Alexander Campbell, M. S.	Brooklyn, N. Y.	Alexander Campbell Milk Co., 802 Fulton street.
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LEWIS COUNTY

Alger Factory, B. & C.	Martinsburg, N. Y.	G. W. Alger.
Arctic Union, B. & C.	Croghan, N. Y.	Geo. Bush.
Barnes Corners, B. & C.	Barnes Corners.	Loren D. Fox.

LEWIS COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Beach Hill, C.....	Croghan, N. Y.....	Orrin Feterly.
Beaver Falls, M. S.....	Beaver Falls, N. Y.....	Alex. Campbell Milk Co., 802 Fulton st., Brooklyn, N. Y.
Black River Valley Cream & Milk Co.....	Lyons Falls, N. Y. R. F. D. 1.....	John Lemkau, 678 113th st., New York City.
Boston Brand, B. & C.....	Lowville, N. Y.....	Edward Wheeler.
F. M. Burns, B. & C.....	Copenhagen, R. F. D. 2..	John May, Copenhagen, R. F. D. 1.
Castorland, M. S.....	Castorland, N. Y.....	Bordens Condensed Milk Co., 108 Hudson st., New York City.
Cedar Spring, C.....	Glenfield, N. Y.....	M. J. Fries.
Cloverdale, C.....	Constableville, R. F. D. 1	Wallace Miner.
Conifers Corners, C.....	West Leyden, N. Y.....	Sims Bros.
Copenhagen Condensary.....	Copenhagen, N. Y.....	Brown & Bailey Co., 90 Third ave., Brooklyn, N. Y.
Crofort Hill, C.....	Constableville, N. Y.....	Hilton E. Mills.
Crown Brand M. Co., M. S., B. & C.....	Denmark, N. Y.....	Crown Brand Milk Co.
Crystal Brook, C.....	Boyd, N. Y.....	Dan Ryan, Copenhagen.
Dairy Hill, B. & C.....	Constableville, N. Y.....	Edward Miller.
Deer River M. S.....	Deer River, N. Y.....	H. M. Schwarz, New York City.
Denley Station, M. S.....	Leyden Station.....	Bordens Condensed Milk Co. 108 Hudson st., New York City.
Dobson, C.....	Harrisville, N. Y.....	W. A. Wear.
Domser C.....	Boonville, N. Y.....	Philip Domser.
Eagle, B. & C.....	Lowville, N. Y.....	Glenn Bellenger, Lowville, R. F. D. 4.
East Martinsburg, M. S.....	East Martinsburg, N. Y..	Mutual-McDermott Dairy Co., 127 W. 42d st., New York City.
East Martinsburg, Milk & Cheese Co.....	East Martinsburg, N. Y..	East Martinsburg Milk & Cheese Co.
Erie, C.....	Harrisville, N. Y.....	H. W. Stevens.
Excelsior Factory, C.....	Copenhagen, N. Y.....	Thos. Murphy, Copenhagen, R. F. D. 1.
Fall Brook, C.....	Port Leyden, N. Y.....	Wm. F. Karlen, Boonville, N. Y.
Fish Creek, C.....	Lyons Falls, N. Y.....	J. D. Karlen, Boonville, N. Y.
Forest Hill, B. & C.....	Constableville, N. Y.....	Forest Hill Milk & Cheese Co.
Forks, B. & C.....	Copenhagen, N. Y.....	W. E. Brainard.
Forks, No. 2.....	Copenhagen, R. F. D. 2..	R. M. Mills, Watertown, N. Y.
Glenfield, M. S.....	Glenfield, N. Y.....	Mutual McDermott Dairy Co., 127 West 42d st., New York City.
Golf Head, C.....	Glenfield, N. Y.....	Golf Head Milk & Cheese Co.
Gomer Hill, C.....	Turin, N. Y.....	Jacob Dish.
Gowdy, C.....	West Martinsburg, N. Y.	West Martinsburg Milk & Cheese Co., Lowville, N. Y.
Grand Central, B. & C.....	Lowville, N. Y., R. F. D. 4	R. C. Merkle, Lowville, N. Y.
High Market, C.....	Constableville, N. Y.....	A. G. Blum.
Holley C.....	Harrisville, N. Y.....	R. C. Stearns.

LEWIS COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Houseville, C.	Glenfield, N. Y.	Jefferson County Creamery Co., 100 Hudson st., New York City.
Imperial, C.	Carthage, N. Y.	George H. Vorce.
Jerden Falls, C.	Croghan, N. Y.	Eli Chartrand.
Katsmayer Creamery, B. & C.	Boonville, N. Y.	A. G. Blum.
Kirschnerville, B. & C.	Croghan, N. Y.	P. J. Ulrich.
Legal Tender, C.	Constableville, N. Y.	O'Shea and Mathis.
Lindsay, C.	Florence, R. F. D.	Frank Brayton.
Lowville Milk & Cream Co.	Lowville, N. Y.	Alexander Campbell Milk Co., 208 Fulton st., Brooklyn, N. Y.
Lowville, M. S.	Lowville, N. Y.	Mutual-McDermott Dairy Co., 127 West 42d st., New York City.
Lyons Falls, M. S.	Lyons Falls, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Maple Ridge, B. & C.	Martinsburg, N. Y.	L. J. Benton.
Mayflower.	Lowville, N. Y.	John Pretti.
McGrath Factory.	West Martinsburg, N. Y.	M. Mahar.
Meadow Brook, B. & C.	Boonville, N. Y.	Uriah Fitch.
Middlebranch, C.	Harrisville, N. Y.	C. R. Brainard.
Miller, C.	Constableville, N. Y.	Hilton E. Mills.
Mohawk Hill, B. & C.	Constableville, R. F. D. 2.	J. F. Bower.
Mountain Spring, C.	Castorland, Route No. 2.	John Yancey.
Mud Lake, C.	West Leyden	Henry Scheff.
Murmer Creek, C.	Kirschnerville, N. Y.	A. N. Renaux.
Natural Bridge, M. S.	Natural Bridge.	Standard Dairy Co., 511-513 East 12th st., New York City.
New Boston, C.	Copenhagen, N. Y.	W. E. Brainard.
New Bremen, M. S.	New Bremen, N. Y.	Alexander Campbell Milk Co., 802 Fulton st., Brooklyn.
New Columbia, B. C.	Copenhagen, R. F. D. 1.	Geo. N. Vary, Copenhagen, N. Y.
New Model, C.	Copenhagen, R. F. D. 1.	H. E. Kelsey.
Osceola, C.	Osceola, N. Y.	John Fox.
Pinckley Corners, B. & C.	Copenhagen, R. 2, Box. 6	H. D. Whiting.
Pine View Milk & Cream Co.	Glenfield, N. Y.	Burt Waldron, Glenfield, R. F. D.
Pleasant View, B. & C.	Castorland, N. Y.	C. D. Wallace.
Plumer, C.	Constableville, N. Y.	David Karlen, Boonville.
Port Leyden, M. S.	Port Leyden, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Prussian Settlement, C.	West Leyden, N. Y.	John Beha.
Rector, B. & C.	Rector, N. Y.	Ben Weiczarek.
Reget, C., C.	Constableville, R. F. D. 2	F. J. Bower, Constableville, N. Y.
Rock Spring, C.	West Leyden.	Byron W. Trainor.
Searl, B. & C.	Lowville, N. Y.	M. E. Searl.
Silver Spring, B. & C.	Copenhagen, R. F. D. 1.	Silver Spring Creamery Co., Copenhagen, N. Y.
Sims Brothers, C.	West Leyden.	Joseph Sims.
South Harrisburg, B. & C.	Copenhagen, R. F. D. 1.	E. C. Lennox.
Star Brook, C.	Barnes Corners, N. Y.	Mr. Patengill, Barnes Corners, N. Y.
Sterling, B. & C.	Natural Bridge, N. Y.	A. E. Ponton.
Sulphur Springs, B. & C.	Lowville, N. Y.	J. Yóusey.

LEWIS COUNTY — (Concluded)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Swiss Creek, B. & C.	Castorland, N. Y.	Peter Bachman.
Talcottville, B. & C.	Talcottville, N. Y.	Talcottville Milk & Cheese Co.
Turin, B. & C.	Turin, N. Y.	B. D. Miller & Son, Lowville, N. Y.
Union of Pinckney, B. & C.	Copenhagen, Route 3.	R. W. Mills, Watertown, N. Y.
Valley Dale, B. & C.	Harrisburg, N. Y.	John May, Harrisburg, N. Y.
Valley Spring, B. & C.	Martinsburg, N. Y.	Fred H. Loucks.
Weiler Corners, C.	Boonville.	David Miller.
Walsh Hill, C.	Turin, N. Y.	E. H. Evans.
West Harrisburg, C.	Copenhagen, N. Y.	Earl I. Wheeler.
West Leyden, C.	West Leyden, N. Y.	Albert F. Miller.
Whitmore, C.	Boonville, N. Y.	W. F. Karlen.
Willow Grove Milk & Cheese Co..	Lowville, R. F. D. 2.	A. B. Zehr.
Willow Spring, C.	Castorland, N. Y.	R. W. Newfer.

LIVINGSTON COUNTY

Ashantee Factory, B.	Avon, N. Y.	Herbert Wadsworth.
Byresville Factory, C.	Dansville, N. Y.	F. E. Butler, Marion Center, Pa.
Caledonia Creamery.	Caledonia, N. Y.	Caledonia Creamery Co.
Lakeville-Brown & Bailey.	Lakeville, N. Y.	Brown & Bailey, 90 Third ave., Brooklyn.
Nunda Factory, B. & C.	Nunda, N. Y.	Henry Dolfinger, Philadelphia, Pa.
Scottsburg, B.	Scottsburg, N. Y.	G. E. Myers.
Tuscarora, M. S.	Tuscarora, N. Y.	Henry Dolfinger, Philadelphia, Pa.

MADISON COUNTY

Ballina, M. S.	Cazenovia, N. Y. R. F. D.	Ullman & Hauk, 513 West 131st st., New York City.
Beaver Creek, C.	Waterville, N. Y.	Beaver Creek Cheese Co.
Bingley, M. S.	Cazenovia, N. Y., R. F. D.	Louis Edelstein, 48 Seigel st., Brooklyn.
Blakslee-Cohen, M. S.	Perryville, N. Y.	I. Cohen, 16 Moore st., Brooklyn.
Blakslee-Clover Farms, M. S.	Perryville, N. Y.	Clover Farms Incorporated, 534 West 48th st., New York City.
Blanding, C.	Brookfield, N. Y.	Excelsior Dairy Co.
Bouckville, M. S.	Bouckville, N. Y.	Borden's Condensed Milk Co. 108 Hudson st., New York City.
Brookfield, B. & C.	Brookfield.	C. O. York.
Brooklyn, M. S.	Cazenovia, N. Y.	P. A. Flannagan.
Bridgeport, C.	Bridgeport, N. Y.	Bridgeport Milk Producers Association.
Canastota, Cond.	Canastota, N. Y.	Middle States Creamery Co.
Canastota, M. S.	Canastota, N. Y.	Levy Dairy Co., 19th st. and Avenue B, Brooklyn, N. Y.
Cazenovia, M. S.	Cazenovia, N. Y.	E. G. Haviland, 367 Seventh ave., Brooklyn.
Chittenango, M. S.	Chittenango Station, N. Y.	Levy Dairy Co., 19th st. and Avenue B, Brooklyn, N. Y.
Clockville, M. S.	Clockville, N. Y.	Levy Dairy Co., 19th st. and Avenue B, Brooklyn, N. Y.

MADISON COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
De Ruyter, M. S.	De Ruyter, N. Y.	E. G. Haviland, 367 Seventh avenue, Brooklyn.
Eaton, M. S.	Eaton, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Erieville, M. S.	Erieville, N. Y.	D. P. Maynard.
Georgetown Station, M. S.	Georgetown Station, N. Y.	Central Dairy Co., 322 East 103d st., New York City.
Georgetown Village, M. S.	Georgetown, N. Y.	B. Fred Saunders.
Hamilton, M. S.	Hamilton, N. Y.	Herman Stuthring, 322 West 48th st., New York City.
Hermitage Farm, M. S.	Canastota, N. Y.	Chapman & Son, 324 East Fayette st., Syracuse.
Hubbardsville, M. S.	Hubbardsville, N. Y.	Empire State Dairy Co., 502 Broadway, Brooklyn.
Kenwood, M. S.	Kenwood, N. Y.	Wm. Jorden, Guilford Center, N. Y.
Lakeport, M. S.	Chittenango Station, N. Y.	Standard Dairy Co., 611 East 12th st., New York City.
Lebanon-Central, M. S.	Lebanon, N. Y.	Central Dairy Co., 322 East 103d, New York City.
Lebanon-Farmers, M. S.	Lebanon, N. Y.	Louis Edelstein, 48 Seigel st., Brooklyn.
Lenox Furnace, C.	Canastota, N. Y., R. F. D. 1.	Zeller Bros., Inc., 37 Montrose ave., Brooklyn, N. Y.
Leonardsville, M. S.	Leonardsville, N. Y.	Phenix Cheese Co., 345 Greenwich st., New York City.
Lloyd, M. S.	Oneida, N. Y.	Lloyd Creamery Co.
Morrisville Station, M. S.	Morrisville Station, N. Y.	Levy Dairy Co., 19th st. and Avenue B, Brooklyn.
Morrisville Village, M. S.	Morrisville, N. Y.	Elsworth G. Franklin.
Munns, M. S.	Munnsville, N. Y.	J. H. Muller, 513 West 55th st., New York City.
Nelson, B. & C.	Nelson, N. Y.	Samuel Fieldman, 618 East 9th st., New York City.
Newton, C.	Cazenovia, N. Y., R. F. D. 2.	Warren Newton.
New Woodstock, C.	New Woodstock, N. Y.	R. F. Stevens Co., 82 Third ave., Brooklyn.
New Woodstock, M. S.	New Woodstock, N. Y.	R. F. Stevens Co., 82 Third ave., Brooklyn.
North Brookfield, C.	North Brookfield, N. Y.	Samuel Kappler, Lee Center, N. Y.
North Brookfield, M. S.	North Brookfield, N. Y.	High Ground Dairy Co., 447 Madison st., Brooklyn.
Oneida Castle, C.	Oneida Castle, N. Y.	Central New York Butter, Cheese and Cream Association.
Peterboro, M. S.	Peterboro, N. Y.	Middle States Creamery Co., Canastota, N. Y.
Poolville, M. S.	Poolville, N. Y.	Levy Dairy Co., 19th st., and Avenue B, Brooklyn.
Pratts, M. S.	Pratts Hollow, N. Y.	J. H. Doshier, 343 West 38th st., New York City.

MADISON COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Randallsville, M. S.	Randallsville, N. Y.	Fred Wolpmann, 586 Hudson boulevard, West Hoboken, N. J.
River Forks, M. S.	River Forks, N. Y.	Phenix Cheese Co., 345 Greenwich st., New York City.
Sheds, M. S.	Sheds, N. Y.	Levy Dairy Co., 19th st., and Avenue B, Brooklyn.
Shefford, C.	Chittenango, N. Y.	Shefford Cheese Co., 417 Fulton st., Syracuse.
Siloam, C.	Munnsville, N. Y.	A. E. Miller.
Solsville, M. S.	Solsville, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
South Bay, M. S.	Canastota, N. Y., R. F. D. 3.	Levy Dairy Co., 19th st., and Avenue B, Brooklyn.
Sullivan, M. S.	Canastota, N. Y., R. F. D. 1.	Standard Dairy Co., 611 East 12th st., New York City.
Tally, C.	Brookfield, N. Y.	Phenix Cheese Co., 345 Greenwich st., New York City.
Valley Mills, C.	Stockbridge, N. Y.	Valley Mills Co.
Valley Mills, M. S.	Stockbridge, N. Y.	J. H. Muller, 513 West 55th st., New York City.
Wampsville, M. S.	Wampsville, N. Y.	Christian Oher, 158 Eagle st., Brooklyn, N. Y.
West Edmeston, M. S.	West Edmeston, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.

MONROE COUNTY

Beach Ice Cream Co.	Rochester, N. Y.	Clarence E. Booth, 641 Clinton ave., No. Rochester.
Big Elm Dairy Co., M. S.	Rochester, N. Y.	Big Elm Dairy Co., 476 Exchange st.
Bowker's Creamery Co.	Rochester, N. Y.	Bowker's Creamery Co., 131 Colvin st.
Brethen, Jos. S.	Rochester, N. Y.	Jos. S. Brethen, 448 Lyall ave.
Brighton Place Dairy Co.	Rochester, N. Y.	Brighton Place Dairy Co., 1757 East ave.
Bristol, W. L.	Rochester, N. Y.	W. L. Bristol, 620 South ave.
Chamberlain Ice Cream Co.	Rochester, N. Y.	Walter F. Chamberlain, 180 Meigs st.
Danishelsky, S.	Rochester, N. Y.	S. Danishelsky, 168 Borden st.
Downey's Ice Cream Co.	Rochester, N. Y.	Downey & Bohrer, 33 Hudson ave.
Elgin Creamery Co., B.	Honeoye Falls, N. Y.	W. W. Shepard.
Genesee Valley Milk Products Co.	Rochester, N. Y.	Genesee Valley Milk Products Co., 239 Hudson ave.
Haeg Creamery.	Rochester, N. Y.	John C. Haeg, 155 Cady st.
Honeoye Falls, Elgin Creamery Co.	Honeoye Falls, N. Y.	Honeoye Falls, Elgin Creamery Co.
Judson Street Creamery.	Rochester, N. Y.	Frederick R. Ziegler, 47 Judson st.

MONROE COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Kleehammer Creamery.....	Rochester, N. Y.....	Albert Kleehammer, 857 Portland ave.
Mertz, L. A.....	Rochester, N. Y.....	L. A. Mertz, 47 Fulton ave.
Mertz Creamery.....	Rochester, N. Y.....	August Mertz, 419 Hawley st.
Muhs Brothers Creamery.....	Rochester, N. Y.....	Muhs Brothers Creamery, 82 Conkey ave.
Ritter Creamery.....	Rochester, N. Y.....	Ritter Bros., 20 Harris st..
Rochester Ice Cream Co.....	Rochester, N. Y.....	Rochester Ice Cream Co., Cliff st.
Rosewood Dairy.....	Rochester, N. Y.....	A. J. Campbell, 47 Rosewood Terrace.
Thompson's Creamery.....	Rochester, N. Y.....	George E. Thompson, 164 Champlain st.
20th Ward Creamery.....	Rochester, N. Y.....	Martin T. May, 562 Maple st.

MONTGOMERY COUNTY

Ames Factory, C.....	Ames, N. Y.....	Anna G. Diefendorf.
Buel, M. S.....	Canajoharie, N. Y., R. F. D.....	Brown & Bailey Condensed Milk Co., 90 Third ave., Brooklyn.
Canajoharie, Cond.....	Canajoharie, N. Y.....	Brown & Bailey Condensed Milk Co., 90 Third ave., Brooklyn.
Cayadetta Factory, C.....	Fonda, N. Y., R. F. D. 2.....	Richard W. Schuyler.
Charleston Factory, C.....	Glen, N. Y., R. F. D. 1.....	W. Ward.
Flat Creek Creamery.....	Sprakers, N. Y., R. F. D. 2.....	Flat Creek Cream and Butter Association.
Fort Hunter, M. S.....	Fort Hunter, N. Y.....	Orange County Milk Company, 541 West 22d st., New York City.
Fort Plain—Borden's M. S.....	Fort Plain, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Fort Plain—Dairy Kitchen, M. S..	Fort Plain, N. Y.....	Charles N. Smith.
Fort Plain Creamery.....	Fort Plain, N. Y.....	Fort Plain Milk Co.
Fultonville, Cond.....	Fultonville, N. Y.....	Orange County Milk Company, 541 West 22d st., New York City.
Getman Factory, C.....	Fort Plain, N. Y.....	Casper Getman.
Glen Creamery, B. & C.....	Glen, N. Y.....	Glen Creamery Co., Inc.
Hallsville, M. S.....	Fort Plain, N. Y.....	Fort Plain Milk Co.
Maple Grove Factory, C.....	Randall, N. Y., R. F. D.....	Abell & Keeler.
Marshville Factory, C.....	Canajoharie, N. Y., R. F. D. 2.....	Geo. Kocher.
Mohawk Factory, C.....	Fonda, N. Y.....	Daniel Duxtater, Palatine Bridge; N. Y.
Nadler Creamery, M. S.....	Amsterdam, N. Y.....	Nadler Bros.
Palatine Milk Co., C.....	Palatine Bridge, N. Y., R. F. D. 1.....	Herman Brower.
Randall, M. S.....	Randall, N. Y.....	Central Dairy Co., 322 East 103d st., New York City.
Rex, M. S.....	Fort Plain, N. Y.....	Fort Plain Milk Co.
Root Factory, C. (Rural Grove)...	Randall, N. Y.....	E. J. Higgins, Sprakers, N. Y.
Sprakers, M. S.....	Sprakers, N. Y.....	Levy Dairy Co., 19th st. and Avenue B, Brooklyn.

MONTGOMERY COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
St. Johnsville, Cond.....	St. Johnsville, N. Y.....	Mohawk Condensed Milk Co., 71 Hudson st., New York City.
St. Johnsville, M. S.....	St. Johnsville, N. Y.....	Modern Dairy Co., 868 Dean st., Brooklyn.
Sprout Brook, Sk. Sta.....	Canajoharie, N. Y., R. F. D. 2.....	Fort Plain Milk Co.
Stone Arabia, M. S.....	Fort Plain, N. Y., R. F. D. 6.....	Fort Plain Milk Co.
Tribes Hill Creamery, C.....	Tribes Hill, N. Y.....	Tribes Hill Creamery Co.
Valley Factory, C.....	Saltspringville, N. Y.....	Cyrene Flint.
Waterville, M. S.....	Canajoharie, N. Y., R. F. D.....	Brown & Bailey Condensed Milk Co., 90 Third ave., Brooklyn.

NIAGARA COUNTY

La Barbera, C.....	Niagara Falls, N. Y.....	Steave La Barbera, 1517 13th st
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ONEIDA COUNTY

Adams Factory, C.....	Ava, N. Y.....	Oliver Ernest.
Agen & Moore, M. S.....	Rome, N. Y.....	Agan & Moore, 404 West Court st., Rome, N. Y.
Alder Creek, M. S.....	Alder Creek, N. Y.....	Levy Dairy Co., New York City.
Ankin Bros., C.....	Lee Center, N. Y.....	Ankin Bros.
Ankins-Hawkins Corners.....	Rome, N. Y.....	Chas. B. Ankin, R. F. D., 6. Rome, N. Y.
Annsville No. 24, C.....	Taberg, N. Y.....	Hasselbeck Cheese Co., 596 Jef- ferson st., Buffalo, N. Y.
Augusta Dairy Assn., C.....	Augusta, N. Y.....	Augusta Dairy Assn.
Ava Corners, C.....	Ava, N. Y.....	Eugene Traxel.
Baker, C.....	Remsen, N. Y., R. F. D.....	W. J. Bennett, Holland Patent, N. Y.
Bartlett, C.....	Bartlett, N. Y.....	Matti Bros., 414 John st., Utica N. Y.
Bartlett, M. S.....	Bartlett, N. Y.....	Levy Dairy Co., New York City.
Bennett, W. J., B. & C.....	Holland Patent, N. Y.....	W. J. Bennett.
Blackman Corners, C.....	Verona, N. Y.....	J. Karlan & Son, Rome, N. Y.
Blake, C.....	Taberg, N. Y., R. F. D.....	J. Karlan & Son, Rome, N. Y.
Blanchard's Cry., M. S.....	Vernon, N. Y., R. F. D. 1.....	Utica Ice Cream Co., Utica, N. Y.
Blossvale, M. S.....	Blossvale, N. Y.....	Levy Dairy Co., New York City.
Blossvale No. 19, C.....	Blossvale, N. Y.....	Hasselbeck Cheese Co., Buffalo, N. Y.
Blue Brook, C.....	Ava, N. Y., R. F. D.....	David Karlen, Boonville, N. Y.
Boonville, M. S.....	Boonville, N. Y.....	Empire State Dairy Co., 502 Broadway, Brooklyn, N. Y.
Boonville Cry. & Cold Storage Co.	Boonville, N. Y.....	Boonville Cry. & Cold Storage Co., 9 Liberty St., Utica, N. Y.
Boonville Milk & Cream Co., M. S.	Boonville, N. Y.....	Alex. Campbell Milk Co., 802 Fulton st., New York City.
Bridgewater, M. S.....	Bridgewater, N. Y.....	Phenix Cheese Co., South Edmeston, N. Y.
Brodock Factory, C.....	Rome, N. Y. R. F. D.....	Sam Kappler, Lee Center, N. Y.
Brown, C.....	West Branch, N. Y.....	Frank Karlen.

ONEIDA COUNTY — (*Continued*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Buckhill, C.	Westonville, N. Y., R. F. D.	J. Karlen & Son, Rome, N. Y.
Camden Cry., Inc., M. S.	Camden, N. Y.	John E. Rosasco, 13 Morton st., New York City.
Camden, M. S.	Camden, N. Y.	Borden's Cond. Milk Co., New York City.
Chuckery, M. S.	New York Mills, N. Y.	W. C. Risley.
Churchville, C.	Verona, N. Y., R. F. D.	J. Karlen & Son, Rome, N. Y.
Christen, A., C.	Florence, N. Y.	Albert Schoff, Camden, N. Y.
Clinton, M. S.	Clinton, N. Y.	R. F. Stevens & Co., 82 Third ave., Brooklyn, N. Y.
Clover Leaf Creamery, B. & C.	Remsen, N. Y.	B. K. Brown Son & Co.
Colburn, C.	Camden, N. Y.	J. Karlen & Son, Rome, N. Y.
Colburn Creamery, M. S.	Rome, N. Y.	C. O. Colburn, 708 Beachman ave.
Cold Spring, M. S.	N. Y. Mills, N. Y.	W. C. Risley.
Cold Spring, C.	Holland Patent, N. Y. R. F. D.	George Wittwer, Syracuse, N. Y.
Coleman Mill, M. S.	Oriskany, N. Y.	F. Abel.
Conway, C.	Remsen, N. Y.	A. G. Blum.
Coonrad, C.	Rome, N. Y., R. F. D. 1.	J. Karlen & Son.
Cooney Factory, C.	Taberg, N. Y., R. F. D. 1.	J. Karlen & Son, Rome, N. Y.
Cornish, C.	Lee Center, N. Y.	Ankin Bros.
Crooked Brook, C.	Barneveld, N. Y., R. F. D. 1.	J. E. Rosasco, 13 Morton st., New York City.
Deerfield Center, C.	Deerfield Center, N. Y., R. F. D. 2.	J. E. Rosasco, 13 Morton st., New York City.
Delaney, T. B., Creamery, M. S.	Rome, N. Y.	T. B. Delaney, 50 James st.
Dix, C.	Rome, N. Y.	Joseph Schmidt, R. F. D. 7.
Doxstader, C.	Durhamville, N. Y.	Sam Kappler, Lee Center, N. Y.
Dunn Brook, C.	Boonville, N. Y., R. F. D. 4.	J. Karlen & Son, Rome, N. Y.
East Camden No. 24, C.	Camden, N. Y.	Hasselbeck Cheese Co., Buffalo, N. Y.
East Steuben, M. S.	East Steuben, N. Y.	Levy Dairy Co., New York City.
Edell, C.	Rome, N. Y., R. F. D.	Sam Kappler, Lee Center, N. Y.
Elpis, C.	West Vienna, N. Y.	Ralph Stevens.
Furmen, C.	Boonville, N. Y., R. F. D. 6.	Walter Furmen.
Flagg & Baker Creamery, M. S.	Rome, N. Y.	Flagg & Baker, 431 West Thomas st.
Flint Brook, C.	Boonville, N. Y., R. F. D.	John Ruchti.
Florence Hill, C.	Florence, N. Y.	Edward Clark, Westdale, N. Y.
Floyd Hill, C.	Holland Patent, N. Y., R. F. D.	John Roscup, Stittville, N. Y.
Floyd Corners, C.	Stittville, N. Y., R. F. D. 1.	J. Karlen & Son, Rome, N. Y.
Forward No. 9, C.	McConnellsville, N. Y.	Hasselbeck Cheese Co., Buffalo, N. Y.
Francis, C.	Remsen, N. Y.	A. G. Blum.
Frenchville, C.	Westernville, N. Y., R. F. D.	J. Karlen & Son, Rome, N. Y.
Glenmore, C.	Glenmore, N. Y.	Joseph Hooper.

ONEIDA COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Glenmore, No. 27, C.....	Taberg, N. Y., R. F. D...	Hasselbeck Cheese Co., Buffalo, N. Y.
Goodsell Creameries, M. S.....	Rome, N. Y.....	E. B. Goodsell, 210 North James st. and 330 West Court st.
Greens Crossing, C.....	Cassville, N. Y.....	Standard Dairy Co., 611 East 12th st., New York City.
Greenway, M. S.....	Verona, N. Y.....	Model Dairy Milk & Cream Co.
Harlem Dairy Products Company, M. S.....	Clinton, N. Y.....	Harlem Dairy Products Co., 168 East 92d st., New York City.
Haven, C.....	Waterville, N. Y.....	Sam Kappler, Lee Center, N. Y.
Hawkinsville, C.....	Boonville, N. Y.....	Galle Bros., Rochester, N. Y.
Hecla, C.....	Westmoreland, N. Y.....	Christian Oher, 158 Eagle st., Brooklyn, N. Y.
Hennessy, C.....	Camden, N. Y., R. F. D...	John F. Hennessy.
Highland Mills, M. S.....	Rome, N. Y.....	Charles D. Ankin, R. F. D. 6.
Hillsboro, C.....	Camden, N. Y., R. F. D. 3	Seymour Spoon.
Hillside, C.....	Boonville, N. Y., R. F. D. 4	J. Karlen & Son, Rome, N. Y.
Hillside Union, C.....	Northwestern, N. Y.....	Sam Kappler, Lee Center, N. Y.
Holland Patent, M. S.....	Holland Patent, N. Y.....	Holland Patent Milk & Cream Company.
Honondaga, C.....	Remsen, N. Y.....	A. G. Blum.
Houghton Factory, C.....	Camden, N. Y., R. F. D. 3	Merritt Houghton.
Hulburt, C.....	Rome, N. Y., R. F. D. 6..	Charles D. Ankin.
Hyde, C.....	Rome, N. Y.....	Sam Kappler, Lee Center, N. Y.
John Ingersoll, C.....	Alder Creek, N. Y.....	John Ingersoll.
Irish Ridge, C.....	Verona, N. Y.....	J. Karlen & Son, Rome, N. Y.
Jackson Hill, C.....	Boonville, N. Y.....	David Karlen.
Kirkland Branch, C.....	Camden, N. Y.....	James Kirkland, R. F. D.
Kirkland Creamery, B.....	Kirkland, N. Y.....	Elmer C. Austin.
Knoxboro Creamery, B. & C.....	Knoxboro, N. Y.....	E. G. Smith.
Lee Center, C.....	Lee Center, N. Y.....	Sam Kappler.
Lee Center, No. 17, C.....	Lee Center, N. Y.....	Hasselbeck Cheese Co., Buffalo, N. Y.
Lee Center, No. 30, C.....	Lee Center, N. Y.....	Hasselbeck Cheese Co., Buffalo, N. Y.
Lowell, B. & C.....	Rome, N. Y., R. F. D. 7..	Lowell Butter & Cheese Co.
Marcy, M. S.....	Marcy, N. Y.....	Ullman & Hauk Dairy Co., New York City.
Marshall, M. S.....	Cassville, N. Y., R. F. D.	Newark Milk & Cream Co., Newark, N. J.
Merry, G., C.....	Verona, N. Y.....	F. H. Merry.
Miller, W. K., C.....	Boonville, N. Y.....	W. K. Miller.
Mitchell, C.....	Lee Center, N. Y.....	Ankin & Kappler.
Mitchell Creamery, M. S.....	N. Y. Mills, N. Y.....	James Mitchell.
Mohawk Condensed Milk Co., M. S.....	Deansboro, N. Y.....	Mohawk Condensed Milk Co. 71 Hudson st., New York City.
Moore, William Creamery, M. S...	Rome, N. Y.....	Wm. Moore, 121 North Washington st.
Moose Creek, C.....	Boonville, N. Y., R. F. D.	David Karlen.

ONEIDA COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Mullen Hill, C.....	West Branch, N. Y., R. F. D.	J. Karlen & Son, Rome, N. Y.
North Bay, C.....	North Bay, N. Y.....	J. Karlen & Son, Rome, N. Y.
North Bridgewater, M. S.....	Cassville, N. Y., R. F. D.	Charles H. Helmer.
North Deerfield Creamery, B. & C.	Deerfield, N. Y., R. F. D.	E. Rosasco, New York City.
N. Steuben, C.....	Remsen, N. Y.....	J. D. Karlen, Boonville, N. Y.
Northwestern, C.....	Northwestern, N. Y.....	J. Karlen & Son, Rome, N. Y.
Ohms, C.....	Boonville, N. Y., R. F. D. 4	David Karlen.
Oneida Castle, M. S.....	Oneida Castle, N. Y.....	Levy Dairy Co., New York City.
Oriskany Creamery, B.....	Oriskany, N. Y.....	H. E. Putnam.
Oriskany, M. S.....	Oriskany, N. Y.....	Christian Jetter, 43 Perry st., New York City.
Parish Hill Creamery.....	Parish, N. Y.....	Perry G. Smith.
Plank Road, C.....	Boonville, N. Y.....	W. F. Karlen.
Point Rock, C.....	Point Rock, N. Y.....	Sam Kappler, Lee Center, N. Y.
Porter, C.....	Remsen, N. Y., R. D. 1.	Van Black Bros.
Prospect Junction, M. S.....	Prospect, N. Y.....	Prospect Milk & Cream Co.
Quaker Hill.....	Westernville, N. Y.....	Hasselbeck Cheese Co., Buffalo, N. Y.
Rathbun, C.....	Verona, N. Y.....	J. Karlen & Son, Rome, N. Y.
Redmond Corners, C.....	Boonville, N. Y., R. F. D.	Boonville Creamery & Cold Storage Co., 9 Liberty st., Utica, N. Y.
Remsen, M. S.....	Remsen, N. Y.....	Remsen Milk & Cream Co.
Rider, J. C. & Co., M. S.....	Bridgewater, N. Y.....	J. C. Rider & Co., 102 Newman ave., Brooklyn, N. Y.
Riverside Creamery, M. S.....	Oriskany, N. Y.....	A. Knauer, 351 Columbia st., Utica, N. Y.
Rome, C.....	Rome, N. Y., R. F. D.	Hasselbeck Cheese Co., Buffalo, N. Y.
Roser, C.....	Ava, N. Y.....	D. Karlan, Boonville.
Sauer Factory, C.....	Glenmore, N. Y., R. F. D.	J. Karlen & Son, Rome, N. Y.
Sauquoit, M. S.....	Sauquoit, N. Y.....	Standard Dairy Co., 611 East 12th st., New York City.
Sauquoit Valley Cry., M. S.....	Washington Mills, N. Y.....	A. Knauer, 351 Columbia st., Utica, N. Y.
Sefert, C.....	Rome, N. Y.....	Sam Kappler, Lee Center, N. Y.
Seminole Condensed Milk Co., M. S.....	Holland Patent, N. Y.....	Seminole Condensed Milk Co.
Shean, C.....	Glenmore, N. Y.....	Frank Reid.
Smith, C.....	Camden, N. Y.....	Albert Schoff.
South Trenton, C.....	South Trenton, N. Y.....	Alfred Blum, Rome, N. Y., R. F. D. 7.
South Western, C.....	North Western, N. Y.....	Frank Turck, Holland Patent, N. Y.
Spring Brook, C.....	Boonville, N. Y.....	A. G. Blum, Remsen, N. Y.
Stacey Basin, C.....	Verona, N. Y., R. F. D.	Sam Kappler, Lee Center, N. Y.
Star Hill, C.....	Remsen, N. Y., R. F. D.	Wm. Roscup.
State Bridge, C.....	Durhamville, N. Y.....	J. Karlen & Son, Rome, N. Y.
State Bridge, M. S.....	Durhamville, N. Y.....	Levy Dairy Co., New York City.
Steuben Center, C.....	Remsen, N. Y.....	P. C. Mills.

ONEIDA COUNTY — (Concluded)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Steuben Valley, C.....	Barneveld, N. Y.....	W. J. Bennett, Holland Patent, N. Y.
Stittville, M. S.....	Stittville, N. Y.....	Ullman & Hauk Dairy Co., New York City.
Stokes, C.....	Stokes, N. Y.....	J. Karlen & Son, Rome, N. Y.
Stokes, No. 6, C.....	Stokes, N. Y.....	Hasselbeck Cheese Co., Buffalo, N. Y.
Stokes No. 29, C.....	Stokes, N. Y.....	Hasselbeck Cheese Co., Buffalo, N. Y.
Stone Road, M. S.....	Cassville, N. Y.....	Newark Milk & Cream Co., Newark, N. J.
Strauem No. 7, C.....	West Branch, N. Y.....	Hasselbeck Cheese Co., Buffalo, N. Y.
Taberg, C.....	Taberg, N. Y.....	Fred Bartell.
Teuscher, G., C.....	Rome, N. Y., R. F. D. 2..	David Teuscher.
Thomas, Griff, C.....	Rome, N. Y., R. F. D. 4..	Charles Ankin, Lee Center, N. Y.
Traxel, C.....	Rome, N. Y., R. F. D....	Sam Kappler, Lee Center, N. Y.
Trenton, M. S.....	Barneveld, N. Y.....	Trenton Milk & Cream Co.
Vernon Center Sanitary Dairy, B. & C.....	Vernon Center, N. Y.....	Vernon Center Sanitary Dairy Co.
Vernon Dairy Co., M. S.....	Vernon, N. Y.....	Levy Dairy Co., New York City.
Vernon, M. S.....	Vernon, N. Y.....	Levy Dairy Co., New York City.
Verona Station, M. S.....	Verona Station, N. Y....	Beakes Dairy Co., New York City.
Vienna Shipping Station & Creamery, C.....	Vienna, N. Y.....	Arthur Grant.
Walker Road, C.....	Deerfield, N. Y.....	Matti Bros., John st., Utica, N. Y.
Waterbury, C.....	Camden, N. Y., R. F. D. 4	James Kirkland.
West Branch, C.....	West Branch, N. Y.....	David Karlen, Boonville, N. Y.
West Branch No. 21, C.....	West Branch, N. Y.....	Hasselbeck Cheese Co., Buffalo, N. Y.
Westdale, M. S.....	Westdale, N. Y.....	J. E. Rosasco, 13 Morton st., New York.
West Lee, C.....	Lee, N. Y.....	J. Karlan & Son, Rome, N. Y.
Westmoreland Cooperative Dairy Co., B. & C.....	Rome, N. Y., R. F. D....	Westmoreland Cooperative Dairy Co.
Whaley, J. H., Creamery, B. & C..	Higginsville, N. Y.....	J. H. Whaley, Rome, N. Y.
White, C.....	Lee, N. Y.....	J. Karlen & Son, Rome, N. Y.
White Factory, C.....	Stokes, N. Y.....	J. Karlen & Son, Rome, N. Y.
Wolcott Hill, C.....	Camden, N. Y.....	S. Ankin, Lee Center, N. Y.
Williams Creamery, M. S.....	Rome, N. Y.....	Thomas Williams, 313 South James st.
Willow Valley, C.....	Boonville, N. Y.....	David Karlen, Boonville, N. Y.
Wood Creek, C.....	Rome, N. Y., R. F. D....	Sam Kappler, Lee Center, N. Y.
Wrights Settlement, C.....	Rome, N. Y.....	Chas. Ankin, Lee Center, N. Y.

ONONDAGA COUNTY

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Amber, B.	Amber, N. Y.	L. J. Edinger.
Apulia, M. S.	Apulia, N. Y.	Alex. Campbell Milk Co., 802 Fulton st., New York City.
Baldwinsville, B.	Baldwinsville, N. Y.	Kelley & Scriber.
Baldwinsville, M. S.	Baldwinsville, N. Y.	Seiler Brothers, 472 Plain st., Newark, N. J.
Belgium, C.	Belgium, N. Y.	H. C. Stebbins.
Bennett, C.	Homer, N. Y. R. F. D. 3.	C. H. Bennett.
Borodino, B.	Skaneateles, N. Y.	Borodino Creamery Co.
Brewerton, C.	Brewerton, N. Y.	Brewerton Cheese Factory Asso- ciation.
Camillus, B.	Camillus, N. Y.	Camillus Cooperative Creamery Co.
Cicero, C.	Cicero, N. Y.	C. J. Buckley.
Cicero Center, C.	Cicero, N. Y.	C. J. Buckley.
Clark, B.	Marcellus, N. Y.	H. J. Clark.
Clay Milk Producers' Factory, C.	Clay, N. Y.	Samuel Fieldman, 623 East 9th st., New York City.
Cloverland Dairy, M. S.	Syracuse, N. Y.	Hawkins & Son, 250 Lincoln ave.
Delphi Falls, Cond.	Delphi Falls, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Euclid, C.	Euclid, N. Y.	W. B. Blanchard.
Eureka, B.	Marcellus, N. Y.	E. D. Gillette.
Fabius, B.	Fabius, N. Y.	Alex. Campbell Milk Co., 802 Fulton st., New York City.
Fabius-National, M. S.	Fabius, N. Y.	National Milk Sugar Co.
Fayetteville, B.	Fayetteville, N. Y.	Fayetteville Milk Producers Co.
Hart Lot, B.	Hart Lot, N. Y.	Cottle Brothers, Skaneateles Junction, N. Y.
Jacksonville, Sk. Sta.	Baldwinsville, N. Y.	Kelley & Scriber.
Jamesville, M. S.	Jamesville, N. Y.	Levy Dairy Co., 19th st., and Avenue B, Brooklyn.
Johnson's, M. S.	Syracuse, N. Y.	241 Tremont st.
Jordan, B.	Jordan, N. Y.	J. H. Lewis.
Kirkville, M. S.	Kirkville, N. Y.	Standard Dairy Co., 611 East 12th st., New York City.
Lamson, M. S.	Lamson, N. Y.	Clover Farms, Inc., 534 Westn 48th st., New York City.
Lysander, B.	Lysander, N. Y.	Kelley & Scriber, Baldwinsville, N. Y.
Memphis, B.	Memphis, N. Y.	W. J. Savage.
Navarino, B.	Navarino, N. Y.	Clyde Harter.
Netherlands Farms, M. S.	Syracuse, N. Y.	Netherlands Farms Dairy, 328 Clifford st.
Onativia, M. S.	La Fayette, N. Y.	Seiler Brothers, 472 Plain st., Newark, N. J.
Oran, M. S.	Oran, N. Y.	Tietjen Bros., Incorporated, 506 East 118th st., New York City.
Otisco, B.	Otisco, N. Y.	E. T. Harter.
Otisco Valley, Sk. Sta.	Spafford, N. Y.	Spafford Creamery Association.
Owasco, Sk. Sta.	Skaneateles, N. Y.	Skaneateles Creamery Co.

ONONDAGA COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Plainville, B.	Plainville, N. Y.	Kelley & Scriber, Baldwinsville.
Pompey, B.	Pompey, N. Y.	Alex Campbell Milk Co., 802 Fulton st., New York City.
Pompey Center, M. S.	Manlius, N. Y., R. F. D. .	Tietjen Bros., Incorporated, 506 East 118th st., New York City.
Prk-Walt, M. S.	Kirkville, N. Y.	Parkers & Walters.
Side Hill Sk. Sta.	Spafford, N. Y.	Spafford Creamery Association.
Skaneateles, B.	Skaneateles, N. Y.	Skaneateles Creamery Co.
Spafford, B.	Spafford, N. Y.	Spafford Creamery Association.
Speich, B.	Marcellus, N. Y.	E. J. Speich.
Tully, M. S.	Tully, N. Y.	W. J. Peach, Pulaski, N. Y.
Tyler Hollow, Sk. Sta.	Marcellus, N. Y.	E. D. Gillette.
Vesper, C.	Vesper, N. Y.	Vesper Creamery Association.
Warner, B.	Warner, N. Y.	Netherlands Farms Dairy Co., 328 Clifford st., Syracuse, N. Y.
Watervale, M. S.	Manlius, N. Y., R. F. D. 3.	Tietjen Bros., Incorporated, 506 East 118th st., New York City.

ONTARIO COUNTY

Bristol Valley Dairy Association, B.	Bristol Center, N. Y.	Bristol Valley Dairy Association.
Geneva Co., M. S.	Geneva, N. Y.	Geneva Milk Co.
Naples, B.	Naples, N. Y.	Nathan Abramson, 72 West 125th st., New York City.
Port Gibson Factory, B.	Port Gibson, N. Y.	Port Gibson Creamery Co.
Sabin, M. S. & B.	Phelps, N. Y.	A. W. Sabin.
White Springs Farm Dairy Co., M. S.	Geneva, N. Y.	White Springs Farm Dairy Co.

ORANGE COUNTY

Beakes, M. S.	Circleville, N. Y.	Beakes Dairy Company, 206 East 12th st., New York City.
Beakes, M. S.	Coldenham, N. Y.	Beakes Dairy Company, 206 East 12th st., New York City.
Beakes, M. S.	East Coldenham, N. Y. ...	Beakes Dairy Company, 206 East 12th st., New York City.
Beakes, Willow Grove, M. S.	Newburgh, N. Y., R. F. D. 4.	Beakes Dairy Company, 206 East 12th st., New York City.
Beakes, M. S.	Monroe, N. Y.	Beakes Dairy Company, 206 East 12th st., New York City.
Beakes, M. S.	Montgomery, N. Y.	Beakes Dairy Company, 206 East 12th st., New York City.
Beakes, M. S.	Rocklett, N. Y.	Beakes Dairy Company, 206 East 12th st., New York City.
Beakes, M. S.	Salisbury Mills, N. Y.	Beakes Dairy Company, 206 East 12th st., New York City.
Eerea, M. S.	Montgomery, N. Y., R. F. D.	R. F. Stevens Co., 82 Third ave., Brooklyn.

ORANGE COUNTY (*Continued*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Borden's, M. S.	Burnside, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.	Florida, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.	Goshen, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.	Johnsons, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, Kipps Station, M. S.	Goshen, N. Y., R. F. D. .	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.	Middletown, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, Neelytown, M. S.	Montgomery, N. Y., R. F. D.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.	New Milford, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.	Otisville, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.	Pine Bush, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.	Sugar Loaf, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.	Washingtonville, N. Y. .	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.	Wisner, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Campbell Hall.	Campbell Hall, N. Y.	R. F. Stevens Co., 82 Third ave., Brooklyn.
Chester Creamery, C.	Chester, N. Y.	W. A. Lawrence.
Crystal Run, M. S.	Crystal Run, N. Y.	Fred Walpman.
Deer Park Creamery.	2 Franklin st., Port Jervis, N. Y.	Deer Park Creamery Co.
East Walden, M. S.	Walden, N. Y.	Hudson Valley Dairy Co., New- burgh, N. Y.
East Walden, M. S.	Walden, N. Y.	Locust Farms Dairy Co., 511 East 35th st., New York City.
Enderlin, M. S.	Orrs Mills, N. Y.	Farmers Dairy Co., Incorporated.
Goshen, M. S.	Goshen, N. Y.	Orange County Milk Association, 138 West 31st st., New York City.

ORANGE COUNTY (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Howells, M. S.....	Howells, N. Y.....	Mutual-McDermott Dairy Co., Incorporated, 224 East 22d st., New York City.
Hull, M. S.....	Middletown, N. Y.....	Bronson Hull.
Little Britain, M. S.....	Little Britain, N. Y.....	George Geier, 454 West 50th st., New York City.
Maybrook, M. S.....	Maybrook, N. Y.....	C. Van Harwood, 90 Second st., Passaic, N. J.
Middletown, M. S.....	Middletown, N. Y.....	Normandie Dairy Prod. Co., Inc., Middletown, N. Y., R. D. 2.
Monroe, M. S.....	Monroe, N. Y.....	Alex Campbell Milk Co., 802 Fulton st., Brooklyn.
Monroe, C.....	Monroe, N. Y.....	The Monroe Cheese Factory.
Montgomery, M. S.....	Montgomery, N. Y.....	Central Dairy Co., 326 East 103d st., New York City.
New Hampton, M. S.....	New Hampton, N. Y.....	Diamond Dairy Co., Carlton ave. and Pacific st., Brooklyn.
Otterkill, M. S.....	Goshen, N. Y., R. F. D.....	M. H. Renken Dairy Co., 1313 Emerson pl., Brooklyn.
Oxford Depot, M. S.....	Monroe, N. Y.....	Alex Campbell Milk Co., 802 Fulton st., Brooklyn.
Port Jervis Creamery.....	Port Jervis, N. Y.....	The Port Jervis Dairy Co.
Port Orange, M. S.....	West Brookville, N. Y.....	C. Metz, 60 Stanhope st., Brooklyn.
Pounds Station, M. S.....	Middletown, N. Y.....	Middletown Milk & Feed Co., Inc.
Rocklett Station, M. S.....	Rocklett, N. Y.....	Levy Dairy Co., 19th st. and Avenue B, New York City.
Sheffield Farms, Slawson-Decker Co., M. S.....	Blooming Grove, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.....	Bullville, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Slate Hill, M. S. & C.....	Slate Hill, N. Y.....	F. Alleva.
Stamford, M. S.....	Stony Ford, N. Y.....	M. Burgman, Incorporated, 156 West 31st st., New York City.
Thompsons Ridge Creamery.....	Thompsons Ridge, N. Y.....	Reed Ice Cream Co.
Thompsons Ridge, M. S.....	Thompsons Ridge, N. Y.....	Reed Ice Cream Co.
Unionville, M. S.....	Unionville, N. Y.....	Brown & Bailey, 90 Third ave., Brooklyn.
Warwick, M. S.....	Warwick, N. Y.....	Central Dairy Co., 226 East 103d st., New York City.
Westtown, M. S.....	Westtown, N. Y.....	Hires Condensed Milk Co., Philadelphia, Pa.

ORLEANS COUNTY

Clarendon, C.....	Clarendon, N. Y.....	Keople & Allen.
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OSWEGO COUNTY

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Altmar, C.	Altmar, N. Y.	First National Bank, Adams, N. Y.
Altmar, M. S.	Altmar, N. Y.	Borden's Condensed Milk Co., New York City.
Amboy Center Cooperative, C.	Williamstown, N. Y.	Chas. Patchen.
Bernhards, M. S.	Bernhards, N. Y.	Jake Smith, New York City.
Bowens Corners, M. S.	Fulton, N. Y., R. F. D. 8.	Keystone Dairy Co., 636 Madison st., Hoboken, N. J.
Brighton Place Dairy Co.	Metcalfe, N. Y.	Brighton Place Dairy Co., Rochester, N. Y.
Carterville, C.	Williamstown, N. Y., R. F. D.	R. S. Starin, Camden, R. F. D. 1.
Castor Plant, D. P. A.	Pulaski, N. Y.	P. M. Murray.
Caughdenoy, M. S.	Caughdenoy, N. Y.	M. Smith, 1 Gouverneur st., New York City.
Central Square, M. S.	Central Square, N. Y.	Cook Milk and Cream Co., 234 Power st., Brooklyn, N. Y.
Cold Brook, C.	Williamstown, N. Y.	J. W. Jones.
Daysville, M. S.	Pulaski, N. Y.	Central Dairy Co., 326 East 103d st., New York City.
Dugway, C.	Altmar, N. Y.	James Doney, Altmar, R. F. D.
East Palermo B. & C. Association	Central Square, N. Y.	East Palermo, B. & C. Association.
Ewart.	Daysville, N. Y.	Mr. Bradshaw, Pulaski, N. Y.
Farmers B & C. Co.	Colosse, N. Y.	Farmers B. & C. Co.
Fernwood, M. S.	Pulaski, N. Y.	Central Dairy Co., 326 East 103d st., New York City.
Fulton, M. S.	Fulton, N. Y.	W. J. Peach, Pulaski, N. Y.
Greenboro, C.	Lacona, N. Y., R. F. D.	Bern Yerdon.
Hannibal, C. & Creamery.	Hannibal, N. Y.	E. B. Tucker & Co.
Hess, C.	West Amboy, N. Y.	Arthur V. Beaupre.
Hillside Creamery.	Oswego, N. Y., R. D.	Hillside Creamery Co., Oswego, N. Y., R. F. D. 2.
Howardsville, C.	Altmar, N. Y.	H. H. Geddis.
Ingalls Crossing, C.	Fulton, N. Y., R. F. D. 6.	E. M. Hopkins.
Ingersoll, C.	Lacona, N. Y.	E. M. Ingersoll.
Lacona, M. S.	Lacona, N. Y.	Lacona Milk Corporation.
Mallory, C.	Mallory, N. Y.	J. Mallory & Son.
Mapleview, M. S.	Pulaski, N. Y., R. F. D.	Central Dairy Co., 325 East 103d st., New York City.
Mayflower, C.	West Monroe, N. Y.	H. E. Potter.
Mayflower, C.	Redfield, N. Y.	W. J. Peach, Pulaski, N. Y.
Mexico, M. S.	Mexico, N. Y.	Central Dairy Co., 325 East 103d st., New York City.
Minetto, M. S.	Oswego, N. Y.	Beakes Dairy Co., New York City.
Mount Pleasant Creamery.	Fulton, N. Y., R. F. D.	Beakes Dairy Co., New York City.
Nestle Food Co.	Fulton, N. Y.	Nestle Food Co.
New Centerville, M. S.	Richland, N. Y.	H. Arnstein, 101 West 140th st. New York City.
New Haven, C.	New Haven, N. Y.	Himan Stoddard.
New Haven, M. S.	Demster, N. Y.	Silberman Dairy Co., 80 Vernon ave., Brooklyn, N. Y.

OSWEGO COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Oneida River, C.....	Caughdenoy, N. Y.....	Clover Farms, Inc., New York City.
Orwell, B. & C.....	Orwell, N. Y.....	John Clark & Bros.
Palermo, C.....	Fulton, N. Y., R. F. D. 4.	G. D. Trimble.
Parish, M. S.....	Parish, N. Y.....	Central Dairy Co., 326 East 103d st., New York City.
Parish Center, C.....	Parish, N. Y.....	L. R. Grant.
Peets Corners Rec. Sta.....	Central Square, N. Y., R. F. D.....	M. Smith, 1 Gouverneur st., New York City.
Pennellville, C.....	Pennellville, N. Y.....	Beakes Dairy Co., 206 East 12th st., New York City.
Pennellville, M. S.....	Pennellville, N. Y.....	Beakes Dairy Co., 206 East 12th st., New York City.
Phoenix, C.....	Phoenix, N. Y.....	Barnasky & Peacock.
Ricard, C.....	Altmar, N. Y.....	J. C. Croniser.
Rosemary Creamery.....	Mexico, N. Y.....	Rosemary Creamery Co.
Salisbury & Peach, C.....	Pulaski, N. Y.....	W. J. Peach.
Salt Road, C.....	Williamstown, N. Y.....	Clarence McLaughlin.
Scriba Center Creamery Co.....	Oswego, N. Y., R. F. D. 2.	The S. S. Brown Co., 105 First st., New York City.
Shoecraft, B. & C. Factory.....	Lacona, N. Y., R. F. D...	M. E. Shoecraft.
South Hannibal, B. & C. Co.....	Fulton, N. Y.....	Fred N. Palmer.
South Granby, M. S.....	South Granby, N. Y.....	Keystone Dairy Co., 636 Madison st., Hoboken, N. J.
Union B. & C. Co.....	Sandy Creek, N. Y.....	W. J. Peach, Pulaski, N. Y.
Vermillion Dairy & Milk Products Co.....	Mexico, N. Y., R. F. D. 3.	W. J. Peach, Pulaski, N. Y.
Williamstown, C.....	Williamstown, N. Y.....	Chas. Kirkland.
Williamstown, M. S.....	Williamstown, N. Y.....	Hauk Dairy Co., 12 Clinton st., Yonkers, N. Y.
West Monroe, M. S.....	West Monroe, N. Y.....	Cook Milk & Cream Co., 234 Powers st., Brooklyn, N. Y.

OTSEGO COUNTY

Borden's, Farm Products Division 105, M. S.....	Cherry Valley, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, Farm Products Div., M. S.....	East Springfield, N. Y....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's M. S.....	Edmestown, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.....	Gilbertsville, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.....	New Berlin, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.

OTSEGO COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Borden's, Farm Products Div., M. S.....	Otego.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, Farm Products Div., M. S.....	Richfield Springs, N. Y....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, Farm Products Div., M. S.....	Schenevus, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.....	South Worcester, N. Y....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.....	Worcester, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Brainards Corners, C.....	Burlington Flats, N. Y....	Phenix Cheese Co., 345 Green- wich st., New York City.
Brick School House, C.....	Burlington Flats, N. Y., R. D.....	E. W. Wright.
Briar Creek, B. & C.....	Otego, N. Y., R. D. 4....	Briar Creek Creamery Co., Inc. 84 Delaware st., Walton, N. Y.
Brockway No. 1, C.....	Richfield, N. Y.....	George T. Brockway.
Burlington Flats, M. S.....	Burlington Flats, N. Y....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Center Valley, C.....	Cherry Valley, N. Y., R. D. 3.....	C. P. Root's Sons, Gilbertsville N. Y.
Chuyle, C.....	Warren, N. Y., R. D.....	L. D. Young, Warren, N. Y.
Clarksville, C.....	Middlefield, N. Y.....	H. C. McRorie.
Decatur, C.....	Worcester, N. Y., R. D....	C. P. Root's Sons, Gilbertsville, N. Y.
Dimmick Hollow, C.....	South New Berlin, N. Y., R. D. 1.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Edmeston, M. S.....	Edmeston, N. Y.....	Levy Dairy Co., 19th st. and Avenue B, New York City.
Elm Brook, C.....	Burlington Flats, N. Y., R. D. 1.....	Hiram Gilmore.
Freer's Home Factory, C.....	Gilbertsville, N. Y.....	Chas. M. Freer.
Fly Creek, C.....	Fly Creek, N. Y.....	Otsego Creamery Co.
Gregory, C.....	Mt. Vision, N. Y.....	Farmers' Cooperative Co., Mt. Vision, N. Y., R. D.
Haith Creamery, C.....	East Springfield, N. Y....	A. C. Haith.
International, M. S.....	Cooperstown, N. Y.....	International Milk Produce Co.
Johnson, C.....	Burlington Flats, N. Y....	Burlington Flats Cheese Co.
Kiley, C.....	Middlefield, N. Y.....	Walter A. Kiley, Cooperstown.
Laemmle, M. S.....	Maryland, N. Y.....	Laemmle Dairy Co., Inc., 316 East 167th st., New York City.

OTSEGO COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS, WHEN DIFFERENT FROM FACTORY ADDRESS
Lena, C.	Hartwick, N. Y., R. D. ...	E. R. Hunt, Morris, N. Y.
Maple Grove, C.	Gilbertsville, N. Y.	J. H. Gilbert & Co.
Maple Valley, C.	Westford, N. Y.	P. B. Roseboom.
Morris, B. & C.	Morris, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Mt. Vision Cooperative Creamery, B.	Mt. Vision.	Mt. Vision Cooperative Creamery Co.
Mutual-McDermott, M. S.	Unadilla, N. Y.	Mutual-McDermott Dairy Cor- poration, 214 East 22d st., New York City.
O'Connell, C.	Cooperstown, N. Y., R. D.	Thomas F. O'Connell.
Oneonta Dairy Co., M. S. & B.	Oneonta, N. Y.	Oneonta Dairy Co.
Pashleys, C.	Burlington, N. Y.	E. W. Coon, 29 South Water st., Philadelphia, Pa.
Patent, C.	Hartwick, N. Y.	Farmers' Cooperative Creamery Co.
Phoenix Mills, B. C. & M. S.	Cooperstown, N. Y., R. D.	Max Blum, 142 Reade st., New York City.
Pine Apple, C.	Milford, N. Y.	O. A. Weatherly & Co.
Plainfield Union, C.	West Winfield, N. Y., R. F. D. 2.	Phenix Cheese Co., 345 Green- wich st., New York City.
Pleasant Brook, C.	Pleasant Brook, N. Y.	C. P. Root's Sons, Gilbertsville N. Y.
Pleasant Valley, C.	Hartwick, N. Y., R. F. D.	Geo. T. Brockway, Richfield, N. Y.
Portlandville, M. S.	Portlandville, N. Y.	R. F. Stevens Co., 82 Third ave., Brooklyn.
Rider, C.	Schuyler Lake, N. Y.	Geo. L. Rider.
River Meadow Farm, C.	Portlandville, N. Y.	McLaury Bros.
Rock Spring, C.	East Springfield, N. Y.	A. C. Haith.
Roots Home, C.	Gilbertsville, N. Y.	C. P. Root's Sons.
Sand Hill Creamery, B. & C.	Wells Bridge, N. Y.	Briar Creek Creamery Co., Inc., 84 Delevan st., Walton, N. Y.
S. F. S. D. Co., M. S.	Colliersville, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
S. F. S. D. Co., M. S.	East Worcester, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
S. F. S. D. Co., M. S.	Oneonta, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
S. F. S. D. Co., M. S.	South Valley, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Snyder, C.	Cherry Valley, N. Y.	Elmer Snyder.
South Edmeston, B. C. & M. S. ...	South Edmeston, N. Y. ...	Phenix Cheese Co., 345 Green- wich st., New York City.
Springfield Farms, C.	Springfield Center, N. Y. ...	Springfield Farms Co.
Stanley, C.	Cherry Valley, N. Y., R. D. 1.	William Shipway.

OTSEGO COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Stevens Corners, C.	Mt. Vision, N. Y., R. F. D.	C. V. Stevens.
Unadilla Creamery	Unadilla, N. Y.	Knott & Southworth.
Wells Bridge, M. S.	Wells Bridge.	Mutual McDermott Dairy Corporation, 214 East 22d St., New York City.
West Exeter Creamery, B.C. & M.S.	West Exeter, N. Y.	Phenix Cheese Co., 345 Greenwich st., New York City.
Westford, C.	Westford, N. Y.	C. E. McRorie.
West Laurens Creamery, C.	West Laurens, N. Y.	C. P. Root's Sons, Gilbertsville, N. Y.
Westville, C.	Schenevus, N. Y., R. F. D.	C. P. Root's Sons, Gilbertsville, N. Y.
White House, C.	Hartwick, N. Y.	Farmers Cooperative Cheese Co.
Wilmarth, C.	Richfield Springs, N. Y.	Geo. T. Brockway.
Zoller Factory, B.	Warren, N. Y.	T. J. Zoller, Little Falls, N. Y.

PUTNAM COUNTY

Baldwin Place — Certified, M. S.	Baldwin Place, N. Y.	Willow Brook Dairy Co., Mt. Vernon, N. Y.
Baldwin Place, M. S.	Baldwin Place, N. Y.	Willow Brook Dairy Co., Mt. Vernon, N. Y.
Brewster, M. S.	Brewster, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Brewster, C.	Brewster, N. Y.	Jerome Corrao & Co., 22 Harrison st., New York City.
Carmel, M. S.	Carmel, N. Y.	Edwin Shoemaker, 615 East 134th st., New York City.
Carmel — Borden's, M. S.	Carmel, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Dykemans, M. S.	Dykemans, N. Y.	Henry Arnstein, New York City.
Mahopac, M. S.	Mahopac, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Mahopac Falls, M. S.	Mahopac Falls, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Oregon, M. S.	Peekskill, N. Y., R. D.	James W. Husted, Peekskill, N. Y.
Patterson, M. S.	Patterson, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Townners, M. S.	Townners, N. Y.	Central Dairy Co., 326 East 103d st., New York City.

RENSSELAER COUNTY

Berlin, Cond.	Berlin, N. Y.	J. H. Satterlee.
Buskirk, M. S.	Buskirk, N. Y.	D. Whiting & Sons, Boston, Mass.
Eagle Bridge, M. S.	Eagle Bridge, N. Y.	H. P. Hood & Sons, Boston, Mass.

RENSSELAER COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Hoosic Elgin System Creamery . . .	Hoosick, N. Y.	A. Hawks.
Johnsonville, M. S.	Johnsonville, N. Y.	D. Whiting & Sons, Boston, Mass.
Nassau, M. S.	Nassau, N. Y.	Locust Farms Co., 551 East 35th st., New York City.
Petersburgh, M. S.	Petersburgh, N. Y.	Springfield Cooperative Co., Springfield, Mass.
Stephentown, M. S.	Stephentown, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
West Hoosick, M. S.	West Hoosick, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.

ST. LAWRENCE COUNTY

Alpha, B. & C.	Lisbon, R. F. D. 3.	Clayton Todd.
Apple Grove, B. & C.	Canton, N. Y., R. F. D. 5.	W. O. Goodison, Morley, N. Y.
Ayrmont Dairy Co., B.	Fort Jackson, N. Y.	Ayrmont Dairy Co., 220 North Delaware ave., Philadelphia, Pa.
Barnes, B. & C.	Canton, N. Y.	Lalove & Smith.
Beakes Dairy Co., M. S. & Cond. . .	Massena Springs, N. Y.	Beakes Dairy Co., 206 East 12th st., New York City.
Beech Grove, B. & C.	Hermon, N. Y.	David Harmer.
Bell Creamery, B. & C.	Brasher Falls, N. Y.	W. E. Bell.
Bellville, B. & C.	Hermon, N. Y.	L. E. Collier.
Bickelhaupt, A., No. 1.	South Hammond, N. Y.	A. Bickelhaupt, Redwood, N. Y.
Bordens, M. S.	De Kalb Junction, N. Y.	Borden's Condensed Milk Co., New York City.
Bordens, M. S.	Gouverneur, N. Y.	Borden's Condensed Milk Co., New York City.
Boston Jersey Creamery, B.	Norfolk, N. Y.	J. G. Turnbull, Orleans, Vt.
Brandy Brook Creamery, B.	Waddington, N. Y.	W. E. Griffith, Madrid, N. Y.
Brasher Center, M. S.	Brasher Falls, N. Y.	W. E. Bell.
Brasher Settlement, M. S.	Brasher Falls, N. Y.	W. E. Bell.
Brasie Corners, B. & C.	Brasie Corners, N. Y.	Weatherup & McCadam.
Brier Hill, M. S.	Brier Hill, N. Y.	A. Koster, 438 West 58th st., New York City.
Brookdale Receiver, M. S.	North Stockholm, N. Y.	H. A. Bullard, Winthrop, N. Y.
Brown & Bailey, B. C. & Cond. . .	Potsdam, N. Y.	Brown & Bailey, 88-94, 3d ave., Brooklyn, N. Y.
Buckton Creamery, B.	Winthrop, N. Y.	The Buckton Creamery Co.
Calaboga, C.	South Hammond, N. Y.	Floyd Hill, Hammond, N. Y.
California, B. & C.	Gouverneur, N. Y.	J. W. Reed.
Cedar Grove, B. & C.	Morristown, N. Y.	John F. Greeley.
Center, B. & C.	Morristown, N. Y.	Leon Overacker.
Centennial Creamery, B.	Ogdensburg, N. Y.	Leo E. Murphy.
Champion Creamery, B.	Madrid, N. Y.	Thos. F. Rutherford.
Chase Mills, M. S.	Chase Mills, N. Y.	Hamilton Dairy Co., New York City.
Cheshire, B. & C.	De Kalb Jct., N. Y.	Jas. L. Wood, Rensselaer Falls, N. Y.
Clare, B. & C.	Clare, N. Y.	H. H. Gill.

ST. LAWRENCE COUNTY — (Continued)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Clover Hill, B. & C.....	Popes Mills, N. Y.....	Gerald Thornhill.
Cold Spring, C.....	Harrisville, N. Y.....	Clarence Hutt.
Cold Spring, B. & C.....	Gouverneur, N. Y.....	Ellsworth Stevenson.
Colton Receiver, M. S.....	Colton, N. Y.....	Brown & Bailey, 88-94 Third ave., Brooklyn, N. Y.
Cooks Corners, C.....	Colton, N. Y.....	Edwin Cook.
Cottage Grove, B. & C.....	Hermon, N. Y.....	Western Brothers.
Cream of the Valley, B. & C.....	Gouverneur, N. Y.....	Jas. Wood & Son.
Crescent, M. S.....	Canton, N. Y.....	South Canton Creamery Co., Canton, N. Y.
Crystal Spring, M. S.....	North Stockholm, N. Y.....	H. A. Bullard, Winthrop, N. Y.
Crystal Spring, B. & C.....	Gouverneur, N. Y.....	E. J. Stevenson.
De Kalb, No. 1, B. & C.....	De Kalb Junction, N. Y.....	U. E. Sayers.
De Kalb, No. 2, B. & C.....	De Kalb Junction, N. Y.....	U. E. Sayers.
Depeyster No. 1.....	Depeyster, N. Y.....	C. E. Griffin.
Depeyster No. 2.....	Depeyster, N. Y.....	C. E. Griffin.
Diamond Creamery Co., Station A, M. S.....	Massena, N. Y.....	J. G. Turnbull, Orleans, Vt.
Dupontville, B. & C.....	South Hammond, N. Y.....	Allen Putnam.
Eagle Creamery, B.....	Nickleville, N. Y.....	H. A. Bullard, Winthrop, N. Y.
East De Kalb, B. & C.....	De Kalb Junction, N. Y.....	Mrs. C. E. Wood.
East Gouverneur, B. & C.....	Gouverneur, N. Y.....	W. A. Freeman.
East Lisbon, B. & C.....	Rensselaer Falls, N. Y.....	John F. Henry.
Eben, M. S.....	Canton, N. Y.....	Brown & Bailey, 88-94 Third ave., Brooklyn, N. Y.
Edwards Village, B. & C.....	Edwards, N. Y.....	Geo. Young.
Edwards, M. S.....	Edwards, N. Y.....	Levy Dairy Co., 19th st., and Avenue B, New York City.
Elm Creek, B. & C.....	Hermon, N. Y.....	W. C. Smith.
Elmdale, B. & C.....	Gouverneur, N. Y.....	Fred M. Campbell.
Elm Grove, B. & C.....	Ogdensburg, N. Y.....	John Cooper.
Elm Grove, B. & C.....	Richfield, N. Y.....	Rickett & Chandler.
Excelsior, M. S. & C.....	Lisbon, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Fair View, C.....	Heuvelton, N. Y.....	W. F. Thornhill.
Farmers Cooperative Creamery, B.	Parishville, N. Y.....	Farmers Cooperative Creamery Co.
Farmers Creamery Co., B. & C....	West Stockholm, N. Y.....	Farmers Creamery Co.
Faville, B. & C.....	Canton, N. Y.....	Earl H. Wood.
Fish Creek, B. & C.....	Heuvelton, N. Y.....	Griffin & Gilson, Heuvelton, N. Y., "Star Route."
Five Corners Creamery, M. S.....	Potsdam, N. Y.....	Brown & Bailey, 88-94 Third ave., Brooklyn, N. Y.
Flackville, B. & C.....	Ogdensburg, N. Y.....	G. L. Fuller.
Fowler, B. & C.....	Fowler, N. Y.....	Farmers Cooperative Co.
Frontier, M. S. & C.....	Ogdensburg, N. Y.....	Sheffield Farms, Slawson-Decker Co., New York City.
Geers Corners, C.....	Harrisville, N. Y.....	Willis Ackerman, Philadelphia, N. Y.
Gilt Edge Creamery, B.....	Madrid, N. Y.....	A. E. Fisher.
Gilt Edge Receiver, M. S.....	Madrid, N. Y.....	A. E. Fisher.
Gouverneur, No. 1, B. & C.....	Gouverneur, N. Y.....	Jesse Wood.
Grass Creek, C.....	South Hammond, N. Y.....	Mrs. Geo. Petrie.

ST. LAWRENCE COUNTY — (*Continued*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Grass River Creamery, B. & C....	Bucks Bridge, N. Y.....	Morris L. Speer, Madrid Springs, N. Y.
Griffith, B. & C.....	Heuvelton, N. Y., Star Route.....	Lloyd Wilson.
Hailsboro, B. & C.....	Hailsboro, N. Y.....	Frank Goodison.
Hammond, M. S.....	Hammond, N. Y.....	T. O. Smith's Sons, 872 6th ave., New York City.
Helena, M. S.....	Helena, N. Y.....	W. E. Griffith, Madrid, N. Y.
Helena, M. S.....	Massena, N. Y., R. F. D.	Beakes Dairy Co., 206 East 12th st., New York City.
Heuvelton, B. & C.....	Heuvelton, N. Y.....	Dr. Jason Turner.
Heuvelton, M. S.....	Heuvelton, N. Y.....	Model Dairy Co., Inc., 246 8th ave., New York City.
Hickory Lake, B. & C.....	Heuvelton, N. Y., Star Route.....	Griffin & Overacker.
Highland, B. & C.....	Canton, N. Y.....	Highland Cheese Co.
Hires Condensed Milk Co.....	Hermon, N. Y.....	Hires Condensed Milk Co., 10 Chestnut st., Philadelphia, Pa.
Horton, J. M., Ice Cream Co.....	Richville, N. Y.....	J. M. Horton Ice Cream Co., 205 E. 24th st., New York City.
Howard, B. & C.....	Rensselaer Falls, N. Y.....	Jas. Wood.
Ideal Creamery, B. & C.....	Lisbon, N. Y.....	Wood & Mayne.
International St. Lawrence Farms.	Gouverneur, N. Y.....	International Milk Products Co. Cooperstown, N. Y.
Island Glen, Long Salt Island, C.	Massena, N. Y.....	I. S. Hopson.
Jenny Creek, C.....	Harrisville, N. Y.....	R. O. Stearns.
Jerusalem, B. & C.....	De Kalb Junction, N. Y..	Lee H. Young.
Johnstown, Sk. Sta. & B.....	Gouverneur, N. Y.....	A. N. Freeman.
Keystone Creamery, B. & C.....	Lisbon, N. Y.....	Robert Dawley.
Keystone Receiver, No. 1, M. S.....	Lisbon, N. Y.....	Robert Dawley.
Keystone Receiver, No. 2, M. S.....	Lisbon, N. Y.....	Robert Dawley.
Knapps, M. S.....	North Stockholm, N. Y.....	Levy Dairy Co., New York City.
Knapps Receiver, M. S.....	No. Stockholm, N. Y.....	J. G. Turnbull, Orleans, Vt.
Lake Shore, B. & C.....	Hammond, N. Y.....	W. J. Townsend.
Langdon Spring Creamery, B.....	Canton, N. Y.....	So. Canton Creamery Co., Canton, N. Y.
Lawrenceville Creamery, B.....	Lawrenceville, N. Y.....	Clarence Irwin.
Lisbon, M. S.....	Lisbon, N. Y.....	Sheffield Farms, Slawson-Decker Co., New York City.
Little River, C.....	Fine, N. Y.....	Elmer Simonds, Oswegatchie, N. Y.
Long Rapids, B. & C.....	Morley, N. Y.....	W. O. Goodison.
Louisville, M. S.....	Louisville, N. Y.....	Beakes Dairy Co., 206 E. 12th st., New York City.
Louisville Landing, M. S.....	Louisville, N. Y.....	J. G. Turnbull, Orleans, Vt.
Lyde Brook, M. S.....	Hopkinton, N. Y.....	Ayrmont Dairy Co., 222 North Delaware ave., Philadelphia, Pa.
Madrid Springs, M. S. & B.....	Madrid Springs, N. Y.....	W. E. Griffith, Madrid, N. Y.
Madrid Springs, M. S.....	Madrid Springs, N. Y.....	Central Dairy Co., 322 East 103d st., New York City.
Maple City Dairy Co., M. S. & B.	Ogdensburg, N. Y., river-front.....	Maple City Dairy Co.
Maple Ridge Receiver, M. S.....	Massena, N. Y.....	J. G. Turnbull, Orleans, Vt.

ST. LAWRENCE COUNTY — (*Continued*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Massena Center Receiver, M. S.	Massena, N. Y.	Beakes Dairy Co., 206 East 12th st., New York City.
Massena Point, M. S.	Massena, N. Y.	J. G. Turnbull, Orleans, Vt.
Mayflower, Barnharts Island, C.	Massena, N. Y.	Long Salt Developing Co.
Meadow Side Creamery, B. & C.	Winthrop, N. Y.	H. A. Bullard.
Meadow Side, M. S.	Winthrop, N. Y.	H. A. Bullard.
Morning Star, B. & C.	Ogdensburg, N. Y.	Isaac Creighton.
Mutual-McDermott Dairy Corp.	Canton, N. Y.	Mutual-McDermott Dairy Corp., 214-224 East 22d st., New York City.
New Century, B. & C.	Ogdensburg, N. Y.	Fred Goodison.
Newfield, C.	Hammond, N. Y.	Henry J. Shoulette.
North Lawrence Creamery M. S. & B.	North Lawrence, N. Y.	W. E. Griffith, Madrid, N. Y.
North Lawrence, M. S.	North Lawrence, N. Y.	Levy Dairy Co., New York City.
North Lisbon Gilt Edge Creamery	Lisbon, N. Y.	Jas. Wood & Co., Ogdensburg, N. Y.
North Russell, B. & C.	Russell, N. Y.	Wm. C. Pool.
Oak Vale, M. S.	South Hammond, N. Y.	Borden's Condensed Milk Co., New York City.
Ogdensburg Creamery, M. S. & B.	Ogdensburg, N. Y.	Ogdensburg Creamery Co., 210 State st.
Osborne Lake, B. & C.	Gouverneur, N. Y.	C. A. Neil.
Oswegatchie, B. & C.	Ogdensburg, N. Y., R. F. D.	Thomas Thornton.
Pierrepont Center, M. S.	Pierrepont, N. Y.	South Canton Creamery Co., Canton, N. Y.
Pine Hill, B. & C.	Brasie Corners, N. Y.	Weatherup & McCadam.
Pleasant Valley, C.	Talleville, N. Y.	Vernon Creighton.
Pleasant Valley, M. S.	Potsdam, N. Y.	Brown & Bailey, 88-94 Third ave., Brooklyn, N. Y.
Plumb Brook, M. S.	Plumb Brook, N. Y.	Tietjen Bros., 506-508 E. 118th st., New York City.
Plum Creek, B. & C.	Russell, N. Y.	Geo. M. Given.
Potsdam Milk Products Co.	Potsdam, N. Y.	Potsdam Milk Products Co.
Rackett River, Station C, M. S.	Rackett River	J. G. Turnbull, Orleans, Vt.
Red Star, C.	Richville, N. Y.	Chas. F. Wood.
Rensselaer Falls	Rensselaer Falls, N. Y.	Sheffield-Farms, Slawson-Decker Co., New York City.
Rensselaer Falls, B. C. & M. S.	Rensselaer Falls	U. E. Sayer, De Kalb Jct., N. Y.
Raymondville, M. S. & C.	Raymondville, N. Y.	Tietjen Bros., 506-508 East 118th st., New York City.
Red Rock, M. S.	De Kalb Junction, N. Y.	Brown & Bailey, 88-94 Third ave, Brooklyn, N. Y.
Riverside Creamery, M. S. & C.	Chase Mills, N. Y.	Austin I. Harriman.
Rock Bottom, B. & C.	Richville, N. Y.	Gilson & Beach.
Rosebud, B. & C.	Hermon, N. Y.	Westurn Brothers.
Rosie, B. & C.	Rosie, N. Y.	Zina McMullen, Hammond, N. Y.
Royal, B. & C.	Heuvelton, N. Y.	Griffin & Kirby.
Ruby, B. & C.	Brasie Corners, N. Y.	Weatherup & McCadam.
Russell Village, B. & C.	Russell, N. Y.	A. D. Frowley.
Sacker Brook, Sterling, M. S.	Waddington, N. Y.	Hamilton Dairy Co., 620 West 131st st., New York City.
St. Lawrence, B. & C.	Brier Hill, N. Y.	John Dodds.

ST. LAWRENCE COUNTY — (Concluded)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Scotch Settlement, C.	South Hammond, N. Y.	Wm. Fortune.
Settlement, B. & C.	Canton, N. Y.	L. J. Sipher.
South Canton, M. S.	Canton, N. Y.	South Canton Creamery Co., Canton, N. Y.
South Canton Creamery, B. & C.	Canton, N. Y.	South Canton Creamery Co., Canton, N. Y.
South Colton Creamery, B.	Colton, N. Y.	G. A. Lindsay, South Colton, N. Y.
South Gouverneur, B. & C.	Gouverneur, N. Y.	Renford Stevenson.
South Hermon, C.	Gouverneur, N. Y.	James P. Morse.
Southfield Creamery, B.	Allan Falls, N. Y.	E. D. Thompson, Potsdam, N. Y., R. F. D.
Spaulding Creamery, B.	Madrid Springs, N. Y.	J. L. Mack.
Spragueville, B. & C.	Spragueville, N. Y.	John H. Berry.
Steel Corners, C.	Spragueville, N. Y.	John H. Berry.
Sunrise, B. & C.	Ogdensburg, N. Y.	Robert Creighton.
Sylvia Lake, C.	Spragueville, N. Y.	D. E. Parker, Gouverneur, N. Y.
Tanner Creek, B. & C.	De Kalb Junction, N. Y.	W. E. Fairbanks.
Thousand Islands, C.	Chippewa Bay, N. Y.	Rhode Babcock.
Trout Lake, C.	Hermon, N. Y.	H. G. Chandler, Ogdensburg, N. Y.
Unique, B. & C.	Lisbon, N. Y.	Geo. Woodrick.
Waddington Creamery, C.	Waddington, N. Y.	W. E. Griffith, Madrid.
Waddington, M. S. & Cond.	Waddington.	Hamilton Dairy Co., New York City.
Wegatchie, C.	Gouverneur, N. Y.	Albert Salmon.
West Canton, B. & C.	Canton, N. Y.	Geo. Griffith, De Kalb Junction, N. Y.
West Hermon, B. & C.	De Kalb Junction, N. Y.	Fairbanks & Benjamin.
West Howard, B. & C.	Rensselaer Falls, N. Y.	Jesse Wood.
West Pierrepont, B. & C.	West Pierrepont, N. Y.	C. J. McNeil.
West Potsdam, M. S.	Potsdam, N. Y.	Brown & Bailey, 88-94 Third ave, Brooklyn, N. Y.
White Clover, B. & C.	Fine, N. Y.	Chas. Montroy.
Wildwood, C.	Colton.	O. S. Russell.
Winthrop, M. S.	Winthrop, N. Y.	Levy Dairy Co., New York City.

SARATOGA COUNTY

Ballston Spa, Creamery.	Ballston Spa, N. Y.	C. S. Gilbert.
Gansevoort, M. S.	Gansevoort, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Saratoga Creamery Association.	Schuylerville, N. Y., R. F. D.	Saratoga Creamery Association.
Kings Creamery.	Porter Corners, N. Y.	N. G. Woodard.

SCHENECTADY COUNTY

Delanson Creamery.	Delanson, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Pattersonville Creamery.	Pattersonville, N. Y.	John D. Patterson.

SCHOHARIE COUNTY

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Argusville, C.....	Argusville, N. Y.....	C. P. Root's Sons, Gilbertsville.
Borden's, M. S.....	Middleburgh, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.....	Schoharie, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.....	Sharon Hill, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Borden's, M. S.....	Sharon Springs, N. Y.....	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Breakabeen, Sk. Sta.....	Breakabeen, N. Y.....	Broome Center Coop. Creamery Co., Gilboa, N. Y., R. F. D.
Broome Center Creamery, B.....	Gilboa, N. Y., R. F. D.....	Broome Center Cooperative Creamery Co.
Carlisle Creamery, B.....	Carlisle, N. Y.....	Carlisle Coop. Creamery Co.
Charlotteville Elgin Creamery, B.....	Charlotteville, N. Y.....	Charlotteville Elgin Cooperative Creamery Co.
Conesville, Sk. Sta.....	Manorkill, N. Y.....	Manorkill Cooperative Cream- ery Co., Gilboa, N. Y.
Fairlands, Sk. Sta.....	West Fulton, N. Y.....	West Fulton Cooperative Cream- ery Co.
Gallupville Creamery, B.....	Gallupville, N. Y.....	Gallupville Cooperative Cream- ery Co.
Gilboa Creamery, B.....	Gilboa, N. Y.....	Mutual McDermott Dairy Co., 214 East 22d st., New York City.
Huntersland Cooperative Creamery, B.....	Middleburgh, N. Y., R. F. D., 2.....	Huntersland Cooperative Cream- ery Co.
Jerome, Sk. Sta.....	Summit, N. Y.....	Summit Cooperative Creamery Co.
Manorkill Creamery, B.....	Manorkill, N. Y.....	Manorkill Cooperative Cream- ery Co., Gilboa, N. Y.
Mutual McDermott, M. S.....	South Gilboa, N. Y.....	Mutual McDermott Dairy Cor- poration, 214 East 22d st., New York City.
North Blenheim Creamery.....	North Blenheim, N. Y.....	Albert Parker, 554 Grand st., New York City.
Rose Creamery.....	Cobleskill, N. Y.....	Chas. Rose.
Sheffield Farms, Slawson-Decker Co., Grade A, M. S.....	Cobleskill, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524, West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.....	Cobleskill, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.....	Central Bridge, N. Y.....	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.

SCHOHARIE COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Sheffield Farms, Slawson-Decker Co., M. S.	Howes Cave, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.	Hyndsville, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.	Jefferson, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.	Richmondville, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.	Seward, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.	Sloansville, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Sheffield Farms, Slawson-Decker Co., M. S.	W. Richmondville, N. Y. .	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Summit Cooperative Creamery B. .	Summit, N. Y.	Summit Cooperative Creamery Co.
West Fulton Cooperative Creamery, B.	West Fulton, N. Y.	West Fulton Cooperative Creamery Co.

SCHUYLER COUNTY

Alpine, C.	Alpine, N. Y.	Nathan Abramson, 752 West 125th st., New York City.
Alpine, M. S.	Alpine, N. Y.	Beakes Dairy Co., 206 East 12th st., New York City.
Bennettsburg Logan Co., C.	Bennettsburg, N. Y.	W. & I. Mekeel, Jacksonville, N. Y.
Cayuta, M. S.	Cayuta, N. Y.	J. Max, 195 Livingston st., Newark, N. J.
Cayutaville.	Cayutaville, N. Y.	W. & I. Mekeel, Jacksonville N. Y.
Odessa, M. S.	Odessa, N. Y.	Halpin Bros., 74 Samoset st., Newark, N. J.
Logan, C.	Hector, N. Y.	W. & I. Mekeel, Jacksonville, N. Y.
Townsend, C.	Watkins, N. Y.	Townsend Cheese Association.

SENECA COUNTY

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Covert, Sk. Sta.	Covert, N. Y.	W. & I. Mekeel, Jacksonville.
Interlaken, M. S.	Interlaken, N. Y.	Frank Rogow, 119 West 28th st., Bayonne, N. J.
Lewis, M. S.	Ithaca.	Helen S. Lewis, 207 Willow ave.
Mae Dougall, M. S.	Mae Dougall, N. Y.	Frank Rogow, 119 West 28th st., Bayonne, N. J.
Varick, M. S.	Geneva, N. Y., R. F. D., 5	Mt. Vernon Dairy Co., 87 Ches- ter ave., Irvington, N. Y.

STEUBEN COUNTY

Addison, M. S.	Addison, N. Y.	M. H. Renken, 131 Emerson pl., Brooklyn, N. Y.
Arkport Creamery, C.	Arkport, N. Y.	Horseheads Creamery Co., Horseheads, N. Y.
Avoca Factory, C.	Avoca, N. Y.	Louis U. Coffin.
Bath, M. S.	Bath, N. Y.	Borden's Condensed Milk Co., Hudson st., New York City.
Bennetts Creek, C.	Canisteo, N. Y., R. D. 1..	W. C. Bassett.
Big Creek, C.	Hornell, N. Y.	C. M. Burdette.
Brasted Dist., C.	Hornell, N. Y.	H. D. Stratton, Hornell, N. Y., R. D. 3
Brown, C.	Andover, N. Y.	Wm. E. Green, Andover, N. Y., R. D. 2.
Brown Town, C.	Lindley, N. Y., R. D. 1..	Brown Town Cheese Co.
Call, Hill, C.	Andover, N. Y., R. D. 1..	D. A. Oakes, 14 Alley, Hornell, N. Y.
Campbell, M. S.	Campbell, N. Y.	R. F. Stevens & Co., 82 Third Ave., Brooklyn, N. Y.
Canisteo, B.	Canisteo, N. Y.	E. L. Stephens.
Caton Center, C.	Corning, N. Y., R. F. D. 2.	A. C. Lewis.
Central Factory, C.	Lindley, N. Y.	L. A. Wheeler.
Clover Dale Factory, B.	South Canisteo, N. Y.	Clover Dale Butter Co., Canis- teo, N. Y.
Cobb, C.	Hornell, N. Y.	Seymour Bridge.
Cobb Factory, C.	Canisteo, N. Y.	W. C. Kellogg.
Cohocton Factory, B.	Cohocton, N. Y.	Wetmiller Bros.
Cold Spring, C.	Alfred Station, N. Y.	George M. Grow.
Dryden Ridge, C.	Greenwood, N. Y.	J. J. Stooks.
Dutch Street, C.	Hornell, N. Y.	Bert Helmer.
Elgin Creamery	Savona, N. Y.	Elgin Creamery Co.
Elmboise, C.	Prattsburg, N. Y.	Ernest Peltham.
Eureka, C.	Campbell, N. Y.	Rising Bros.
Goodhue, C.	Addison, N. Y.	F. E. Zimmer.
Goodyear, M. S.	Corning, N. Y.	Clair Goodyear 379 Third st.
Greenwood, B.	Greenwood, N. Y.	Coston Co.
Hartsville Center, C.	Hartsville, N. Y.	C. M. Haynes, Hornell, N. Y., R. F. D.
Haskinsville, C.	Haskinsville, N. Y.	F. L. Jones, Cohocton, N. Y.
Highup, C.	Troupsburg, N. Y.	F. E. Zimmer, Addison, N. Y.
Hedgesville, C.	Woodhull, N. Y., R. D. .	C. R. Perry.
Hopper, C.	Troupsburg, N. Y.	F. E. Zimmer, Addison, N. Y.
Hornby, C.	Hornby, N. Y.	E. M. Cady, Beaver Dams, N. Y.
Howard, Sk. Sta.	Howard, N. Y.	R. F. Stevens & Co., 82 Third ave., Brooklyn, N. Y.

STEUBEN COUNTY — (Concluded)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Howell, M. S.	Addison, N. Y.	Borden's Condensed Milk Co., New York City.
Jasper, B. & C.	Jasper, N. Y.	T. O. Swan.
June, B.	Hornell, N. Y.	H. R. June.
Lindley, C.	Lindley, N. Y.	C. W. Carpenter, Lawrenceville, Pa.
Lynn, C.	Prattsburg, N. Y.	J. B. Pike.
Mann, M. S.	Corning, N. Y.	W. F. Mann.
Neils Creek, C.	Avoca, N. Y.	George Clymo.
Newark Milk & Cream Co., Cond.	Canisteo, N. Y.	Newark Milk & Cream Co., Newark, N. J.
North Cameron, C.	Canisteo, N. Y.	W. C. Kellogg.
North Jasper, C.	Cameron, N. Y., R. D. 3.	North Jasper Dairy Co., Cam- eron, N. Y.
Orchard Park, C.	Greenwood.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Pond, C.	Avoca, N. Y., R. D.	Lewis Spaulding, Howard, N. Y.
Prattsburg, C.	Prattsburg, N. Y.	T. L. McManimon.
Presho, C.	Lindley, N. Y.	Presho Cheese Co.
Rexville, C.	Rexville, N. Y.	J. J. Stooks, Greenwood, N. Y.
Savona, M. S.	Savona, N. Y.	R. F. Stevens & Co., 82 Third ave., Brooklyn, N. Y.
Shovel Hollow, C.	Andover, N. Y., R. D. 1.	Lewis Kellenberger.
Spring Valley Co., B.	Hornell, N. Y., R. D. 4.	Spring Valley Dairy Co.
Thornbottom, C.	Troupsburg, N. Y.	J. H. Prutsman.
Towlesville, C.	Kanona, N. Y.	Louis U. Coffin.
Troupsburg, B. & C.	Troupsburg, N. Y.	Troupsburg Butter & Cheese Co.
Wallace, C.	Wallace, N. Y.	Daniel Starling.
West Caton, C.	Corning.	West Caton Cheese Association.
West Jasper, C.	Greenwood, N. Y.	F. E. Zimmer, Addison, N. Y.
West Rathbone, C.	Rathbone, N. Y.	William D. Widger.
Wheeler, C.	Wheeler, N. Y.	Wheeler Cheese Co.
Woodhull, C.	Woodhull, N. Y.	J. M. McStay.
Wilde Evaporated Milk Co., The John.	Lawrenceville, N. Y.	The John Wilde Evaporated Milk Co., Columbus, Ohio.
Young Hickory, C.	Rexville, N. Y.	Young Hickory Cheese Co.

SULLIVAN COUNTY

Beechridge Creamery, B. & C.	Stevensville, N. Y.	Harris Joffey, 14 East 114th st., New York City.
Bock Brook Creamery, Sk. Sta.	North Branch, N. Y.	Samuel Katz, 544 Grand st., New York City.
Borden's, M. S.	Cochecton, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Briscoe, B. & C.	Briscoe, N. Y.	Samuel Perlman.
Callicoon, M. S.	Callicoon, N. Y.	Sullivan County Creamery Co., Jeffersonville, N. Y.
Callicoon Elgin Creamery, B.	Callicoon Center, N. Y. ...	Ross Baldwin.
Centerville, M. S.	Centerville Station, N. Y.	E. D. Offen.
Empire State, M. S.	Liberty, N. Y.	Empire State Dairy Co., 502 Broadway, Brooklyn, N. Y.

SULLIVAN COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Empire State, M. S.	Stevensville, N. Y.	Empire State Dairy Co., 502 Broadway, Brooklyn, N. Y.
Empire State, M. S.	White Sulphur Springs, N. Y.	Empire State Dairy Co., 502 Broadway, Brooklyn, N. Y.
Evans Dairy Co., M. S.	Winterton, N. Y.	W. M. Evans Dairy Co., 32 Lexington ave., Brooklyn, N. Y.
Fremont Center Creamery.	Fremont Center, N. Y.	Samuel Katz, 544 Grand St., New York City.
Fulboam, M. S.	Milanville, Pa.	Fulboam Creamery Co., Patterson, N. Y.
Fulton Creamery, B.	Ferndale, N. Y.	A. P. Fulton.
Hankins Creamery, M. S.	Hankins, N. Y.	Sullivan County Creamery Co., Jeffersonville, N. Y.
Hasbrouck, M. S.	Hasbrouck, N. Y.	Central Dairy Co., 322 East 103rd st., New York City.
High View, M. S.	High View, N. Y.	Luke Blake, 959 6th ave, New York City.
Hurleyville, M. S.	Hurleyville, N. Y.	Central Dairy Co., 322 East 103rd st., New York City.
Hurleyville, M. S.	Hurleyville, N. Y.	Jewish Cooperative Farmers' Federation.
Jeffersonville, M. S.	Jeffersonville, N. Y.	Sullivan County Dairy Co.
Kenoza Lake, M. S.	Kenoza Lake, N. Y.	Sullivan County Dairy Co., Jeffersonville, N. Y.
Livingston Manor, M. S.	Livingston Manor, N. Y.	Parksville Dairy Co., 117th st., New York City.
Mongaup Valley Creamery, B. & C.	Mongaup Valley, N. Y.	John Manzi.
Mountaindale, M. S.	Mountaindale, N. Y.	Levy Dairy Co., 19th st., and Avenue B, New York City.
Narrowsburg, M. S.	Narrowsburg, N. Y.	M. H. Renken Dairy Co., 131 Emerson pl., Brooklyn, N. Y.
Parksville Dairy, B. & C.	Parksville, N. Y.	Parksville Dairy Co., 117th st., New York City.
Pinney Creamery, M. S.	Liberty, N. Y.	E. E. Pinney.
Rockland, M. S.	Roscoe, N. Y.	M. Zausner, 1154 Park ave. New York City.
Wurtsboro, M. S.	Wurtsboro, N. Y.	John Draves Sons, 130 Union st., Union Hill, N. J.
Youngville Creamery, C.	Youngville, N. Y.	Samuel Katz, 544 Grand st., New York City.

TIOGA COUNTY

Apalachin, M. S.	Apalachin, N. Y.	I. Cohen, 16 Moore st., Brooklyn.
Barton, M. S.	Barton, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Beers, M. S.	Owego, N. Y.	Beers Ice Cream Co.
Berkshire, M. S.	Berkshire, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Candor, M. S.	Candor, N. Y.	Alex. Campbell Milk Co., 802 Fulton st., Brooklyn, N. Y.

Tioga County—(Concluded)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Catatonk, M. S.	Catatonk, N. Y.	R. F. Stevens Co., 82 Third ave., Brooklyn.
East Berkshire, B.	Berkshire, N. Y.	Joseph Rabenstein.
Fairfield, C.	Candor, N. Y.	Fairfield Butter and Cheese Co.
Flemingville, M. S.	Owego, N. Y., R. F. D.	R. F. Stevens Co., 82 Third ave., Brooklyn.
Ham, M. S.	Waverly, N. Y.	Joseph Ham.
Lockwood, M. S.	Waverly, N. Y.	Waverly Creamery Co.
Newark Valley, M. S.	Newark Valley, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Nichols, M. S.	Nichols, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
North Spencer, M. S.	North Spencer, N. Y.	Modern Dairy Co., 609 West 49th st., New York City.
Owego, M. S.	Owego, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Richford, M. S.	Richford, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Smithboro, M. S.	Smithboro, N. Y.	R. F. Stevens Co., 82 Third ave., Brooklyn.
Spencer Cond.	Spencer, N. Y.	Empire Creamery Co.
Spencer, M. S.	Spencer, N. Y.	R. F. Stevens Co., 82 Third ave., Brooklyn.
Tioga Center-Erie, M. S.	Tioga Center, N. Y.	Georgianna G. Martin, 572 Greenwich st., New York City.
Tioga Center Lehigh Valley, M. S.	Tioga Center, N. Y.	Levi Smith, 620 South 10th st., Newark, N. J.
Waits, Sk. Sta.	Waits, N. Y.	Sayre Creamery & Cold Storage Co., Sayre, Pa.
Waverly, M. S.	Waverly, N. Y.	Waverly Creamery Co.
West Candor, M. S.	West Candor, N. Y.	E. G. Haviland, 367 Seventh ave., Brooklyn, N. Y.

TOMPKINS COUNTY

Caroline, C.	Brookton, N. Y.	W. W. Conrad, Brookton, R. D. 2, N. Y.
Cornell Dairy School, M. S.	Ithaca, N. Y.	Department of Dairy Industry, Cornell University, Ithaca, N. Y.
Crystal Fountain, B.	Slaterville Springs, N. Y.	Hires Condensed Milk Co., Arch st., Philadelphia, Pa.
Davis, M. S.	Ithaca, N. Y., R. F. D.	Department of Dairy Industry, Cornell University, Ithaca, N. Y.
Dryden-Borden, M. S.	Dryden, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., N. Y. City.
Dryden-Haviland, M. S.	Dryden, N. Y.	E. G. Haviland, 367 7th ave., Brooklyn.
Gibbs, M. S.	Ithaca, N. Y.	Bert Gibbs.

TOMPKINS COUNTY—(Concluded)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Groton, M. S.	Groton, N. Y.	Jersey Milk & Cream Co., 353 Morris ave., Newark, N. J.
Groton City, M. S.	Groton, N. Y.	Jersey Milk & Cream Co., 353 Morris ave., Newark, N. J.
Howlands, M. S.	Freeville, N. Y., R. F. D. 16.	Department of Dairy Industry, Cornell University, Ithaca, N. Y.
Hungerford, M. S.	Ithaca, N. Y.	Nye Hungerford.
Ithaca, Cond.	Ithaca, N. Y.	Hires Condensed Milk Co., Arch st., Philadelphia, Pa.
Jacksonville, B.	Jacksonville, N. Y.	W. & I. Mekeel.
Lansingville, M. S.	Ludlowville, N. Y., R. F. D.	Department of Dairy Industry, Cornell University, Ithaca, N. Y.
Luce, M. S.	Ithaca, N. Y.	W. A. Luce.
McLean, M. S.	McLean, N. Y.	Premium Dairy Co., 3480 Fulton st., Brooklyn.
Newfield, B.	Newfield, N. Y.	High Ground Dairy Co., 447 Madison st., Brooklyn.
Newfield, M. S.	Newfield, N. Y.	Empire Creamery Co., Spencer, N. Y.
North Lansing, M. S.	North Lansing, N. Y.	Department of Dairy Industry, Cornell University, Ithaca, N. Y.
Pearson, M. S.	Ithaca, N. Y.	R. S. Pearson.
Peruton, M. S.	Freeville, N. Y., R. F. D. 17.	R. F. Stevens Co., 82 Third ave., Brooklyn.
Sanitary, M. S.	Ithaca, N. Y.	Ithaca Sanitary Ice Cream & Milk Co.
Trumansburg, M. S.	Trumansburg, N. Y.	Cook Milk & Cream Co., 294 Graham ave., Brooklyn.
West Danby, M. S.	West Danby, N. Y.	R. F. Stevens Co., 82 Third ave., Brooklyn.
West Dryden, M. S.	Freeville, N. Y., R. F. D. 16.	Department of Dairy Industry, Cornell University, Ithaca, N. Y.
West Groton, M. S.	Groton, N. Y., R. F. D.	Department of Dairy Industry, Cornell University, Ithaca, N. Y.

ULSTER COUNTY

Borden's, M. S.	Wallkill, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Clintondale, M. S.	Clintondale, N. Y.	R. F. Stevens Co., 82 Third ave., Brooklyn.
Ellenville Creamery.	Ellenville, N. Y.	Newark Cheese Co., 89-91 Warren st., New York City.
Gardiner, M. S.	Gardiner, N. Y.	R. F. Stevens Co., 82 Third ave., Brooklyn.

ULSTER COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Kerhonkson, M. S.	Kerhonkson, N. Y.	Charles Mertz, 62 Stanhope st., Brooklyn, N. Y.
Kingston, M. S.	Kingston, N. Y.	Kingston Milk Producers Creamery Association.
Kyserike, M. S.	Kyserike, N. Y.	John Draves Sons, 130 Union st., Union Hill, N. J.
Modena, M. S.	Modena, N. Y.	R. F. Stevens Co., 82 Third ave., Brooklyn.
New Paltz, M. S.	New Paltz, N. Y.	New Paltz Dairy Co., Inc.
Phinney's Crossing, M. S.	Wallkill, N. Y., R. F. D. .	Mutual-McDermott Dairy Corporation, 214 West 22d st., New York City.
Plattekill, M. S.	Plattekill, N. Y.	Hudson Valley Dairy Co., Newburgh, N. Y.
Realyca, M. S.	Realyca, N. Y.	R. F. Stevens Co., 82 Third ave., Brooklyn.

WARREN COUNTY

Glens Falls Dairy, M. S.	Glens Falls, N. Y.	Frank Herald.
Goss, M. S.	Glens Falls, N. Y.	W. H. Goss, 7 No. Delaware st.

WASHINGTON COUNTY

Archdale, M. S.	Greenwich, N. Y., R. F. D.	D. Whiting & Sons, Boston, Mass.
Argyle Creamery.	Argyle, N. Y.	O. L. Kimball.
Black River, C.	Salem, N. Y., R. F. D. 2. .	J. T. McClellan.
Cambridge, M. S.	Cambridge, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Cossayuna, C.	Cossayuna, N. Y.	Arch Alexander.
East Hartford, C.	East Hartford, N. Y.	Geo. H. Washburn.
Easton, M. S.	Greenwich, N. Y., R. F. D.	D. Whiting & Sons, Boston, Mass.
Fort Ann, M. S.	Fort Ann, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., N. Y. City.
Fort Edward, M. S.	Fort Edward, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
Goose Island, C.	Argyle, N. Y., R. F. D. ...	D. A. Foster.
Granville, M. S.	Granville, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Green Mountain Creamery, B.	White Creek, N. Y.	Green Mountain Creamery Co., Inc.
Greenwich, M. S.	Greenwich, N. Y.	D. Whiting & Sons, Boston, Mass.
Hebron, C.	Salem, N. Y., R. F. D. 2. .	H. R. Wilson.
Hebron Union, C.	Granville, N. Y., R. F. D. 1.	A. G. Parker.
Hebron Valley, C.	Salem, N. Y., R. F. D. 1. .	Hebron Valley Dairy Association.

WASHINGTON COUNTY — (*Concluded*)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Middle Granville, M. S.	Middle Granville, N. Y. . .	Wm. Evens Dairy Co., 32 Lexington ave., Brooklyn.
North Argyle, C.	Argyle, N. Y., R. F. D. 3.	Mrs. Mary E. Shields, Smith's Basin, N. Y., R. F. D. 1.
Normanskill Farms Dairy, M. S. . .	Greenwich, N. Y.	C. P. Stevens, 124 Jay st., Albany, N. Y.
North Hebron, C.	Granville, N. Y., R. F. D.	Wm. Fleming, Granville, N. Y., R. F. D.
Salem, M. S.	Salem, N. Y.	Alex. Campbell Milk Co., 802 Fulton st., New York City.
Sciota, Sk. Sta.	Whitehall, N. Y., R. F. D.	J. H. Low, West Port, N. Y.
Smith's Basin, M. S.	Smith's Basin, N. Y.	Sheffield Farms, Slawson-Decker Co., 524 West 57th st., New York City.
South Argyle, C.	Argyle, N. Y., R. F. D. . .	A. R. McMorris.
South Cambridge, M. S.	So. Cambridge, N. Y.	D. Whiting & Sons, Boston, Mass.
South Easton, C.	Greenwich, N. Y.	E. J. Skiff.
South Hartford, C.	South Hartford, N. Y.	LeRoy J. Dean.
White Creek Creamery.	White Creek, N. Y.	S. R. Lake.
Whitehall, M. S.	Whitehall, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.

WAYNE COUNTY

Angel Corners, Sk. Sta.	Clyde, N. Y.	Clyde Creamery Co.
Clyde Factory, B.	Clyde, N. Y.	Clyde Creamery Co.
Hunt's Corners, Sk. Sta.	Clyde, N. Y., R. F. D. . .	Clyde Creamery Co.
Lyons Factory, B.	Lyons, N. Y.	A. H. Knauss.
Macedon Factory, C.	Macedon, N. Y.	Ralph Cuomo.
Newark Co., C.	Newark, N. Y.	Newark Creamery Co.
Red Creek, C.	Red Creek, N. Y.	Sodus Cooperative Creamery Co., Wolcott, N. Y.
Savannah Factory, B.	Savannah, N. Y.	Shefford Creamery Co., Syracuse, N. Y.
Sodus Cooperative Co., B.	Wolcott, N. Y.	Sodus Cooperative Co.
South Butler, B. & C.	South Butler, N. Y.	Shefford Creamery Co., Syracuse, N. Y.
Peoples' Ice Cream Co.	Macedon, N. Y.	Thomas Gargana.
Walworth Factory, C.	Walworth, N. Y.	F. W. Church, Holley, N. Y.

WESTCHESTER COUNTY

Amawalk, M. S.	Amawalk, N. Y.	Chester Hyatt.
Croton Falls, M. S.	Croton Falls, N. Y.	Borden's Condensed Milk Co., 108 Hudson st., New York City.
Golden's Bridge, M. S.	Golden's Bridge, N. Y. . .	Locust Farms Co., 458, Tenth ave., New York City.
Peekskill, M. S.	Peekskill, N. Y.	Edward J. Lockwood.

WYOMING COUNTY

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS
Arcade Food Products Co., C.	Arcade, N. Y.	Merrell-Soule Co., Syracuse, N. Y.
Attica, M. S.	Attica, N. Y.	Borden's Condensed Milk Co., New York City.
Bennington, C.	Attica, N. Y., R. F. D.	Geo. E. Hogue, Arcade.
Campbell Hill, C.	Gainesville, N. Y., R. F. D.	E. L. Jones, Delevan.
Castile Creamery, B.	Castile, N. Y.	Borden's Condensed Milk Co., New York City.
Centennial, C.	Pike, N. Y., R. F. D.	A. E. Perry, Belfast.
Consolidated Milk Trust, M. S.	Attica, N. Y.	Wolf & Guy.
Cowlesville, Sk. Sta.	Cowlesville, N. Y.	Richardson-Beebe Co., East Aurora.
Cowlesville No. 3, Sk. Sta.	Cowlesville, N. Y.	Adams & Shearing Dairy Co., Marilla, N. Y.
Dale, M. S.	Dale, N. Y.	Merrell-Soule Co., Syracuse, N. Y.
Dutch Flats, C. & B.	Attica, N. Y., R. F. D. 2.	Geo. F. Hogue, Arcade.
East Koy, C.	Portageville, N. Y., R. F. D.	Richardson-Beebe Co., East Aurora.
Elmont, Sk. Sta.	Strykersville, N. Y.	Richardson-Beebe Co., East Aurora.
Hasselbeck, No. 1, C.	Attica, N. Y., R. F. D.	Hasselbeck Cheese Co., Buffalo.
Hasselbeck, No. 3, C.	Attica, N. Y., R. F. D.	Hasselbeck Cheese Co., Buffalo.
Hasselbeck, No. 4, C.	Darien, N. Y., R. F. D.	Hasselbeck Cheese Co., Buffalo.
Hasselbeck, No. 5, C.	Attica, N. Y., R. F. D.	Hasselbeck Cheese Co., Buffalo.
Hasselbeck, No. 7, C.	Varysburg, N. Y., R. F. D.	Hasselbeck Cheese Co., Buffalo.
Hasselbeck, No. 10, C.	Strykersville, N. Y., R. F. D.	Hasselbeck Cheese Co., Buffalo.
Hasselbeck, No. 11, C.	Attica, N. Y., R. F. D.	Hasselbeck Cheese Co., Buffalo.
Hasselbeck, No. 14, C.	Cowlesville, N. Y., R. F. D.	Hasselbeck Cheese Co., Buffalo.
Hasselbeck, No. 22, C.	Strykersville, N. Y., R. F. D.	Hasselbeck Cheese Co., Buffalo.
Hasselbeck, No. 26, C.	Attica, N. Y., R. F. D.	Hasselbeck Cheese Co., Buffalo.
Java, B.	Java, N. Y.	Richardson-Beebe Co., East Aurora.
Java Center, M. S.	Java Center, N. Y.	Richardson-Beebe Co., East Aurora.
Java Village, B.	Java Village, N. Y.	Richardson-Beebe Co., East Aurora.
Java Lake, C.	Arcade, N. Y., R. F. D.	George E. Hogue, Arcade.
Johnsonburg, C. & B.	Johnsonburg, N. Y.	George E. Hogue, Arcade.
Merrell-Soule, P. M. & B.	Arcade, N. Y.	Merrell-Soule Co., Syracuse.
Mud Valley, C.	North Java, N. Y., R. F. D.	Geo. E. Hogue, Arcade.
North Java, C.	North Java, N. Y.	Geo. E. Hogue, Arcade.
Perry's Crossing, C.	Johnsonburg, N. Y., R. F. D.	Richardson-Beebe Co., East Aurora.
Portageville, C. & M. S.	Portageville, N. Y.	Richardson-Beebe Co., East Aurora.
Queen Valley, C.	Varysburg, N. Y., R. F. D.	Richardson-Beebe Co., East Aurora.

WYOMING COUNTY—(Concluded)

NAME OF PLANT	P. O. ADDRESS	NAME OF PROPRIETOR AND P. O. ADDRESS WHEN DIFFERENT FROM FACTORY ADDRESS.
Sheldon, Sk. Sta.....	Strykersville, N. Y.....	Richardson-Beebe Co., East Aurora.
Smith Corners, C.....	Bliss, N. Y., R. F. D.....	George E. Hogue, Arcade.
South Sheldon, C. & M. S.....	Strykersville, N. Y., R. F. D.....	Richardson-Beebe Co., East Aurora.
Star, C.....	North Java, N. Y., R. F. D.....	Geo. E. Hogue, Arcade.
Star No. 4, C.....	Bliss, N. Y.....	G. H. Hatfield.
Tozier, C.....	Varysburg, N. Y., R. F. D.....	Richardson-Beebe Co., East Aurora.
Varysburg, C. & Sk. Sta.....	Varysburg.....	Geo. E. Hogue, Arcade.
Warsaw, Cond. & M. S.....	Warsaw, N. Y.....	Merrell-Soule Co., Syracuse.
Wyoming Valley, B.....	Wyoming, N. Y.....	Wyoming Canning and Preserving Co.

YATES COUNTY

The Dundee Factory, C.....	Dundee, N. Y.....	Chas. Hoyt.
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MILK DEALERS LICENSED UNDER SECTION 55 OF AGRICULTURAL LAW, FOR THE YEAR ENDING SEPTEMBER 1, 1917

NAME	Organization	Address
Adams & Shearing Dairy Co.....	Corporation...	Marilla, N. Y.
Allen, Frank B. (Springfield Creamery)...	Individual...	Springfield, Mass.
Andes Creamery.....	Corporation...	Andes, N. Y.
Anken, Charles D.....	Individual...	Rome, N. Y., R. F. D. No. 6.
Arkport Creamery Co.....	Corporation...	Arkport, N. Y.
Arnstein, Henry.....	Individual	101 W. 140th st., New York City.
Ast, Albert J.....	Individual...	1970 Clinton st., Buffalo, N. Y.
Atwater Bros.....	Partnership...	401 Division st., Elmira, N. Y.
Ayer & McKinney (F. W. Ayer).....	Individual...	Meridale, N. Y.
Ballston Spa Creamery Co.....	Corporation...	Ballston Spa, N. Y.
Barber, Steve.....	Individual...	1517 13th st., Niagara Falls, N. Y.
Baumert, F. X., & Co.....	Partnership...	177 Franklin st., New York City.
Beakes Dairy Co.....	Corporation...	206 E. 12th st., New York City.
Beers Ice Cream Co.....	Partnership...	70 North ave., Owego, N. Y.
Bent Milk Food Corporation.....	Corporation...	Morristown, N. Y.
Beyea, Jay.....	Individual...	Moravia, N. Y.
Bickelhaupt, Adam.....	Individual...	Redwood, N. Y.
Binghamton Ice Cream Co.....	Corporation...	Binghamton, N. Y.
Blake, Luke.....	Individual...	959 6th ave., New York City.
Blessing, Paul.....	Individual...	112 Duerstein ave., West Seneca, N. Y.
Blum, Max.....	Individual...	Remsen, N. Y.
Blumers, John, & Bros.....	Corporation...	146 Reade st., New York City.
Bohner & Seubert.....	Partnership...	535 E. 75th st., New York City.
Boonville Creamery & Cold Storage Co.....	Corporation...	821 Genesee st., Buffalo, N. Y.
Bordens Condensed Milk Co.....	Corporation...	Boonville, N. Y.
Boyd, B. S., & Co.....	Partnership...	108 Hudson st., New York City.
Breakstone Bros., Inc.....	Corporation...	Cannonsville, N. Y.
Briar Creek Creamery Co., Inc.....	Corporation...	344 Greenwich st., New York City.
Brighton Place Dairy Co.....	Corporation...	84 Delaware st., Walton, N. Y.
Brooklyn Milk Co., Inc., The.....	Corporation...	1757 East ave., Rochester, N. Y.
Brown, The S. S., Co.....	Corporation...	262 Bond st., Brooklyn, N. Y.
Brown, B. K., & Son Co.....	Corporation...	105 First st., New York City.
Brown & Root Co.....	Corporation...	Remsen, N. Y.
Bryant & Chapman Co., The.....	Corporation...	167 Reade st., New York City.
Burgmann, M., Inc.....	Corporation...	168 Woodland st., Hartford, Conn.
Byrnes, E. J.....	Individual...	156 W. 31st st., New York City.
Campbell Milk Co., Alexander.....	Corporation...	Merrifield, N. Y.
Cary, T. H., & Co.....	Individual...	802 Fulton st., Brooklyn, N. Y.
Cayuga County Dairy Co.....	Corporation...	110-112 Fulton st., Buffalo, N. Y.
Central Dairy Co.....	Corporation...	12 Franklin st., Auburn, N. Y.
Chapman, I. J., & Son.....	Partnership...	326 E. 103d st., New York City.
Chellis Bros.....	Partnership...	Canastota, N. Y.
Cincinnati Dairy Co.....	Corporation...	Plattsburg, N. Y.
Clark, Datus.....	Individual...	Cincinnati, N. Y.
Clark, Frank J.....	Individual...	Peru, N. Y.
		Easenore, N. Y.

NAME	Organization	Address
Clover-Dale Farms Co.	Corporation...	60 Exchange st., Binghamton, N. Y.
Clover Farms, Inc.	Corporation...	534 W. 48th st., New York City.
Cohen Dairy Co., Inc., The.	Corporation...	60 Lenox ave., New York City.
Cohen, Isaac.	Individual...	16 Moore st., Brooklyn, N. Y.
Colchester Creamery Co., Inc.	Corporation...	84 Delaware st., Walton, N. Y.
Coley, C. H.	Individual...	220 Parkdale ave., Buffalo, N. Y.
Cooke Milk & Cream Co.	Corporation...	294-8 Graham ave., Brooklyn, N. Y.
Coston Co., The.	Corporation...	Greenwood, N. Y.
Delhi Cooperative Dairy Co.	Corporation...	Delhi, N. Y.
Diamond Dairy Co.	Corporation...	Carlton ave., cor. Pacific st., Brooklyn, N. Y.
Dolfinger, Henry.	Individual...	16th & Tasker sts., Philadelphia, Pa.
Domser Bros.	Partnership...	Lewis, N. Y.
Doscher, John H.	Individual...	343 West 38th st., New York City.
Draves Dairy Co., Inc.	Corporation...	Wurtsboro, N. Y.
Dry Milk Co., The.	Corporation...	11 Pine st., New York City.
Edelstein, Louis.	Individual...	48-50 Seigel st., Brooklyn, N. Y.
Effman Dairy Co.	Corporation...	96 Monroe st., New York City.
Ekenberg Co., The.	Corporation...	Cortland, N. Y.
Eiss, Frank.	Individual...	160 Keystone st., Buffalo, N. Y.
Empire Creamery Co.	Corporation...	Allentown, Pa.
Empire State Dairy Co.	Corporation...	502 Broadway, Brooklyn, N. Y.
Ernst, Oliver H.	Individual...	Ava, N. Y.
Evans, W. M., Dairy Co.	Corporation...	32 Lexington ave., Brooklyn, N. Y.
Fairmont Creamery Co.	Corporation...	170 Michigan st., Buffalo, N. Y.
Fargo Dairy, The (Warren Fargo).	Individual...	208 East Main st., Batavia, N. Y.
Farmers National Bank, The.	Corporation...	Church st., Adams, N. Y.
Fieldman, Samuel.	Individual...	618 East 9th st., New York City.
Fitch, Uriah.	Individual...	Route No. 2, Boonville, N. Y.
Fort Plain Dairy Kitchen (Charles N. Smith)	Individual...	Fort Plain, N. Y.
Fort Plain Milk Co., Inc.	Corporation...	Fort Plain, N. Y.
Franklin, Ellsworth G.	Individual...	Morrisville, N. Y.
Franklin County Creamery & Con- densed Milk Co.	Partnership...	North Bangor, N. Y.
Fraser, W. J. & H. R.	Partnership...	Fraser, N. Y.
Fullboam Dairy Co.	Corporation...	Andover, N. J.
Fulton, Arlington P.	Individual...	Ferndale, N. Y.
Furman, Walter.	Individual...	R. F. D. No. 6, Boonville, N. Y.
Galle Brothers.	Partnership...	37-41 Scio st., Rochester, N. Y.
Gifford, Ira E.	Individual...	Poplar Ridge, N. Y.
Gleason, Thos. F.	Individual...	170 West 1st st., Oswego, N. Y.
Grade "A" Dairy Co., Inc.	Corporation...	Jamison Road, N. Y.
Granton Creamery Co.	Corporation...	84 Delaware st., Walton, N. Y.
Green Lake Dairy (Estelle L. Geier) ...	Individual...	453 West 38th st., New York City.
Griffith, Webster E.	Individual...	Madrid, N. Y.
Gruhn, Otto.	Individual...	223 Boerum st., Brooklyn, N. Y.
Hagner, Peter.	Individual...	2354 Main st., Buffalo, N. Y.
Haid, Henry A.	Individual...	97 Grey st., Buffalo, N. Y.
Haith, Albert C.	Individual...	East Springfield, N. Y.
Halcott Centre Creamery Co.	Corporation...	Halcott Centre, N. Y.
Halprin Bros.	Partnership...	74 Somerset st., Newark, N. J.

NAME	Organization	Address
Hamilton Dairy Co.....	Corporation...	620-622 West 131st st., New York City.
Hasselbeck Cheese Co.....	Corporation...	596-606 Jefferson st., Buffalo, N. Y.
Hatch, Frank F.....	Individual...	105 West 46th st., New York City.
Hauk Dairy Co.....	Corporation...	Riverside ave., Yonkers, N. Y.
Haviland, Elbert G.....	Individual...	367 7th ave., Brooklyn, N. Y.
Helmers, Charles H.....	Individual...	Cassville, N. Y..
Hess & Bement.....	Partnership...	1342 E. Ferry st., Buffalo, N. Y.
Heuer, Otto.....	Individual...	Earlville, N. Y.
High-Ground Dairy Co.....	Corporation...	443 Madison st., Brooklyn, N. Y.
Hires Condensed Milk Co.....	Corporation...	913 Arch st., Philadelphia, Pa.
Hoefler Ice Cream Co.....	Corporation...	256 Connecticut st., Buffalo, N. Y.
Hogue, George E.....	Individual...	Arcade, N. Y.
Holland, John P.....	Individual...	Plattsburgh, N. Y.
Hood, H. P., & Sons.....	Corporation...	494 Rutherford ave., Boston, Mass.
Hoosick, N. Y., Elgin System Creamery Assoc.....	Corporation...	Hoosick, N. Y.
Hoover, F. & Son.....	Partnership...	Sterlingville, N. Y.
Horseheads Creamery Co.....	Corporation...	Eleanor st., Horseheads, N. Y.
Horton, J. M., Ice Cream Co.....	Corporation...	205 East 24th st., New York City.
Hudson Condensed Milk Co., Inc.....	Corporation...	913 Arch st., Philadelphia, Pa.
Hudson Milk & Cream Co.....	Individual...	170 Sixth st., Hoboken, N. J.
Hudson Valley Dairy Co.....	Corporation...	Front & First sts., Newburgh, N. Y.
Hull, Brunson A.....	Individual...	173 W. Main st., Middletown, N. Y.
Husted, James H.....	Individual...	1001 Park st., Peekskill, N. Y.
Ideal Dairy Co.....	Corporation...	203 20th st., New York City.
Janssen, F. W.....	Individual...	109 Grand st., Hoboken N. J.
Jefferson County Creamery Co.....	Corporation...	100 Hudson st., New York City.
Jetter, Christian.....	Individual...	43 Perry st., New York City.
Joffey, Harris.....	Individual...	14 East 114th st., New York City.
Jones, George.....	Individual...	Mayville, N. Y.
Jorden, Wm. H.....	Individual...	Union Hill, N. J.
June, Harvey I.....	Individual...	305 Main st., Hornell, N. Y.
Kadans, Louis.....	Individual...	306 Greenwich st., New York City.
Kappler, Samuel.....	Individual...	Lee Center, N. Y.
Karlen, David.....	Individual...	Boonville, N. Y.
Karlen, Frank.....	Individual...	West Branch, N. Y.
Karlen, William F.....	Individual...	Boonville, N. Y.
Katches Dairy Co.....	Corporation...	544 Grand st., New York City.
Kerr, John W.....	Individual...	Mayville, N. Y.
Keystone Dairy Co., The.....	Corporation...	622 Madison st., Hoboken, N. J.
Kinney Brothers.....	Corporation...	243 Water st., Binghamton, N. Y.
Knauer, Andrew.....	Individual...	351 Columbia st., Utica, N. Y.
Koester, Anton.....	Individual...	438 West 58th st., New York City.
Laemmle Dairy Co.....	Corporation...	316 East 157th st., New York City.
Lawrence, Theo. F.....	Individual...	Chester, N. Y.
Lee & Heath.....	Partnership...	37 Winding Way, Binghamton, N. Y.
Leonhardt, Henry.....	Individual...	Redwood, N. Y., R. F. D.
Levy Dairy Co.....	Corporation...	19th st. & Avenue B, New York City.
Libby, McNeill & Libby.....	Corporation...	Union Stock Yards, Chicago, Ill.
Lieber, Izaak.....	Individual...	16 East 107th st., New York City.
Livermore, Harry B.....	Individual...	Moravia, N. Y.
Locust Farms Co.....	Corporation...	458-460 Tenth ave., New York City.
Lograsso, Sebastian.....	Individual...	R. F. D., Angola, N. Y.
Low, John H. (The Westport Creamery)	Individual...	Westport, N. Y.

NAME	Organization	Address
Macedon Creamery Co.....	Corporation...	Macedon, N. Y.
Malone Dairy Co.....	Corporation...	368 10th ave., New York City.
Marks, Benjamin H. (Amity Dairy)...	Individual...	105 West 46th st., New York City.
Martin, Georgina G.....	Individual...	70 Barrow st., New York City.
Merrell-Soule Co., Inc.....	Corporation...	North Franklin & Plum sts., Syracuse, N. Y.
Mertz, Charles.....	Individual...	62 Stanhope st., Brooklyn, N. Y.
Michaelson, Henry.....	Individual...	322-324 West 48th st., New York City
Miller, Albert F.....	Individual...	West Leyden, N. Y.
Miller, B. B. & Son.....	Partnership...	Lowville, N. Y.
Miller, David.....	Individual...	Boonville, N. Y.
Model Dairy Co., Inc.....	Corporation...	246 8th ave., New York City.
Modern Dairy Co., Inc.....	Corporation...	609 West 49th st., New York City.
Mohawk Condensed Milk Co.....	Corporation...	71 Hudson st., New York City.
Monroe Cheese Co., The.....	Corporation...	Monroe, N. Y.
Mountain Side Dairy Co., Inc.....	Corporation...	96 Monroe st., New York City.
Mount Vernon Dairy.....	Corporation...	87 Chester ave., Irvington, N. J.
Mulkin, Ora O.....	Individual...	Friendship, N. Y.
Muller, John H.....	Individual...	513 West 55th st., New York City.
Mundale Creamery Co.....	Corporation...	84 Delaware st., Walton, N. Y.
Murphy, James H.....	Individual...	385 Plymouth ave., Buffalo, N. Y.
Mutual McDermott Dairy Corp.....	Corporation...	214-224 East 22d st., New York City.
Nestle's Food Co.....	Corporation...	555 South 4th st., Fulton, N. Y.
Netherland Farms Dairy, Inc.....	Corporation...	328 Gifford st., Syracuse, N. Y.
Newark Cheese Co., Inc.....	Corporation...	89-91 Warren st., New York City.
Newark Creamery Co., Inc.....	Corporation...	Newark, N. Y.
Newark Milk & Cream Co.....	Corporation...	20 Bridge st., Newark, N. J.
New England Creamery Co.....	Partnership...	16 Cornelia st., Plattsburg, N. Y.
New York Dairy Produce Co.....	Corporation...	388-392 Oakland st., Brooklyn, N. Y.
Normandie Dairy Products Co., Inc...	Corporation...	Middletown, N. Y., R. F. D. No. 2.
Norton, Robert & Co. (Eugene P. Norton).....	Individual...	18 East ave., Attica, N. Y.
Norwich Dairy Co. (Herbert Smith)...	Individual...	Norwich, N. Y.
Offen, Emanuel D.....	Individual...	Centerville Station, N. Y.
Ogdensburg Creamery Co.....	Corporation...	210 State st., Ogdensburg, N. Y.
Oher, Christian.....	Individual...	158 Eagle st., Brooklyn, N. Y.
Oneonta Dairy Co.....	Corporation...	Oneonta, N. Y.
Orange County Milk Association.....	Corporation...	541 West 22d st., New York City.
Ouleout Valley Creamery Co., Inc.....	Corporation...	Delhi, N. Y.
Paker, Albert.....	Individual...	554 Grand st., New York City.
Parksville Dairy Co.....	Partnership...	Parksville, N. Y.
Peach, W. J.....	Individual...	Pluaski, N. Y.
Peoples Milk Co.....	Corporation...	70 East Ferry st., Buffalo, N. Y.
Peru Creamery Co.....	Partnership...	Peru, N. Y.
Phenix Cheese Co.....	Corporation...	345-7 Greenwich st., New York City.
Pinney, E. E.....	Individual...	Liberty, N. Y.
Premium Dairy Co., Inc.....	Corporation...	3480 Fulton st., Brooklyn, N. Y.
Putnam, Harvey G.....	Individual...	Oriskany, N. Y.
Queen City Dairy Co.....	Corporation...	251-257 Seneca st., Buffalo, N. Y.
Rabenstein, Joseph.....	Individual...	Berkshire, N. Y., R. F. D. No. 3.
Rauch, Henry, Co.....	Corporation...	27 Garden st., Brooklyn, N. Y.
Reid Ice Cream Co., The.....	Corporation...	524 Waverly ave., Brooklyn, N. Y.

NAME	Organization	Address
Richardson-Beebe Co., The.	Corporation. . .	Elm st., East Aurora.
Renken, M. H., Dairy Co.	Corporation. . .	131 Emerson place, Brooklyn, N. Y.
Rich, Lulu H.	Individual. . .	Colden, N. Y.
Rich's Jersey Creamery Co.	Corporation. . .	Cattaraugus, N. Y.
Rider, James C., & Co.	Corporation. . .	102 Norman ave., Brooklyn, N. Y.
Rockdale Co., The.	Corporation. . .	Rockdale, N. Y.
Rogow, Frank.	Individual. . .	471 Avenue C, Bayonne, N. J.
Rosasco, John E.	Individual. . .	13 Morton st., New York City.
Roseup, George.	Individual. . .	Stittsville, N. Y.
Rose, Charles.	Individual. . .	Cobleskill, N. Y.
Rosemary Creamery Co., The.	Individual. . .	11 Pine st., New York City.
Royal Dairy Co.	Individual. . .	665 Lake st., Elmira, N. Y.
Ruchti, John.	Individual. . .	Ava, N. Y.
Rushmore, Isaac W., Co.	Corporation. . .	100 Atlantic ave., Brooklyn, N. Y.
Savarese, G., & Son.	Partnership. . .	390 Commercial st., Boston, Mass.
Sayre Creamery & Cold Storage Co.	Corporation. . .	Sayre, Pa.
Schmidt, Joseph.	Individual. . .	Dix, Rome, N. Y., R. F. D. No. 7.
Schumacher, Jacob.	Individual. . .	105 Hamilton st., Buffalo, N. Y.
Schwarz, Henry M.	Individual. . .	422 East 118th st., New York City.
Seiler Bros., Inc.	Corporation. . .	272 Plane st., Newark, N. J.
Seminole Condensed Milk Co.	Corporation. . .	Holland Patent, N. Y.
Sheffield Farms-Slawson Decker Co.	Corporation. . .	524 West 57th st., New York City.
Shefford Cheese Co., Inc.	Corporation. . .	Syracuse, N. Y.
Shoomaker, Edgar.	Individual. . .	615 East 134th st., New York City.
Silver Spring Creamery Co.	Corporation. . .	West Chazy, N. Y.
Slottman, William.	Individual. . .	23 Mangan st., New York City.
Smith, Jacob.	Individual. . .	262 East Broadway, New York City.
Smith, Harry L. (Crittenden Creamery).	Individual. . .	Crittenden, N. Y.
Smith's Sons, T. O.	Partnership. . .	872 6th ave., New York City.
South Canton Creamery Co., Inc.	Corporation. . .	Richville, N. Y.
Standard Dairy Co.	Corporation. . .	611-613 East 12th st., New York City.
Stearns, Ralph O.	Individual. . .	Harrisville, N. Y.
Stevens, R. F., Co.	Corporation. . .	82 Third ave., Brooklyn, N. Y.
Stretch, Charles G.	Individual. . .	Killawog, N. Y.
Stuhring, Herman.	Individual. . .	322 West 48th st., New York City.
Sullivan County Creamery Co.	Partnership. . .	Jeffersonville, N. Y.
Supplee Alderney Dairy, The (C. Henderson Supplee).	Individual. . .	1118 Jefferson st., Philadelphia, Pa.
Szarletta, Thomas.	Individual. . .	1200 Sycamore st., Buffalo, N. Y.
Tagliarino, Joseph.	Individual. . .	133 Front ave., Buffalo, N. Y.
Tait Brothers.	Partnership. . .	134 Cass st., Springfield, Mass.
Tarbell, Gage E.	Individual. . .	Smithville Flats, N. Y.
Teuscher, Godfrey.	Individual. . .	Rome, N. Y.
Thorn, J. W.	Individual. . .	Box 478, Middletown, N. Y.
Tietjen, Bros., Inc.	Corporation. . .	506-508 East 118th st., New York City.
Traxel, E. W.	Individual. . .	Ava, N. Y.
Tulp, Herman (Maple Leaf Dairy).	Individual. . .	Thompson Ridge, N. Y.
Ullmann & Hauk Dairy Co.	Corporation. . .	513 West 131st st., New York City.
Unadilla Creamery Co., Inc.	Corporation. . .	Unadilla, N. Y.
Van Herwarde, C.	Individual. . .	90 Second St., Passaic, N. J.
Vock & Son, Joseph.	Individual. . .	Theresa, N. Y.
Vogt, Jacob.	Individual. . .	117 West Massey st., Watertown, N. Y.

NAME	Organization	Address
Wadsworth, Herbert (Ashantee Creamery)	Individual....	Avon, N. Y.
Walker Ice Cream Co.	Corporation...	309-311 Union st., Warren, Pa.
Warwick Valley Milk Product Co.	Partnership...	Wisner, N. Y.
Weatherly, O. A., & Co.	Partnership...	Milford, N. Y.
Weeks, S. H.	Individual....	Waverly, N. Y.
Wempe, Frederick H.	Individual....	Clinton Mills, N. Y.
West Handsome Brook Creamery Co.	Corporation...	84 Delaware st., Walton, N. Y.
Wetmiller Bros.	Partnership...	Cohocton, N. Y.
Whaley, James H., Creamery Co.	Corporation...	212 North Washington st., Rome, N. Y.
Wheats Ice Cream Co.	Corporation...	221 Elm st., Buffalo, N. Y.
White Springs Farm Dairy Co.	Corporation...	Geneva, N. Y.
Whiting, D., & Sons.	Partnership...	570 Rutherford ave., Boston, Mass.
Wildt, The John, Evaporated Milk Co. .	Corporation...	Columbus, Ohio.
Wiley, Leon H.	Individual....	Champlain, N. Y.
Willow Brook Dairy, Inc.	Corporation...	209 Washington st., Mount Vernon, N. Y.
Wilna Farms Co.	Corporation...	Carthage, N. Y.
Wolpmann, Fred.	Individual....	Union Hill, N. J.
Zausner, Meyer.	Individual....	1504 Park ave., New York City.
Zellner Bros, Inc.	Corporation...	37 Montrose ave., Brooklyn, N. Y.

STATE OF NEW YORK
DEPARTMENT OF AGRICULTURE

CHARLES S. WILSON, Commissioner

Bulletin 89

A Farm Census of New York State

TAKEN BY

The Children in the Rural Schools

JANUARY 1, 1916

To the Reader:



ON behalf of the Department of Agriculture, I wish to express my most hearty appreciation of the success of this — the first state agricultural census taken by the children in the schools of any state. I wish also to extend my sincere thanks to Commissioner John H. Finley and other officials of the Department of Education for their interest and assistance in perfecting plans, to the district superintendents of schools and to the principals and teachers of the 10,500 schools of the state for their excellent cooperation, but most of all to the children themselves upon whom fell the greater burden of the work.

Yet, despite the large effort that the children have put forth, I believe that the value of the census to the school children has been two-fold. In the first place it has been in itself a practical exercise in arithmetic. Each pupil obtained the data for his or her farm or a neighbor's farm. These data were brought to the school, and the district totals for each crop or group of animals computed on the blackboard. Thus, even the smallest children in the school had a part in contributing to a large and constructive piece of work, and at the same time found a new interest in the practical application of school problems to their own community.

I would suggest that further benefits of a similar nature might be derived by using the results of the census as a basis for practical problems in arithmetic. For example, the proportion of the district's production in comparison with the county in the various products named could be readily ascertained, the standing of the county among all counties for each product as suggested in the tables that follow (pages 7, 8, and 9) would be an exercise worth while. Computing proportions of the total production of the highest five or ten or twenty counties under the various items in comparison with that of the whole state would offer further variation and set the pupils thinking.

Secondly, but more important still, the census has had even a deeper value in that it has directed the attention of the school children to the leading farm industries in their districts and to the total value of their farm products; in other words, it has impressed upon them the extent of the rural wealth of their communities and the need for a more self-sustaining agriculture. Never before has their attention been so widely directed to the number of silos in their districts, to the importance of their total output of pigs and chickens. Never before have they given such general consideration to the fact that their districts were capable of producing a given number of bushels of potatoes or a given number of quarts of milk a day. Nor has it ever been possible before to bring the facts for comparison by counties so squarely before them, directing their interest to the result of their own labors.

At a time and in an age when the people of a commonwealth are confronted with the problem of keeping on the farm the boys and girls best fitted for country life and those who will most ably provide for the agriculture of the future, an exercise of this kind that interests the boys and girls in the wealth and possibilities of their own farms, and of their own communities, has a timely and a far-reaching value.

Very truly yours,

A handwritten signature in cursive script, reading "Charles S. Wilson". The signature is written in dark ink and is positioned above the printed name.

Commissioner of Agriculture.

WHAT THE CENSUS HAS SHOWN US

Appreciating the necessity for growth and improvement in the agricultural industry of New York, Commissioner of Agriculture Charles S. Wilson last winter deemed expedient the taking of a state agricultural census, in order to determine the nature of the service wherein the Department's activities were most needed and the localities wherein the need was greatest. Since no funds were available for this purpose, a plan was devised for obtaining the statistics through the aid of the rural schools, a plan that Commissioner of Education John H. Finley readily approved, and to which he and his assistants gladly gave valuable cooperation and advice to carry the project to a successful termination. The work of enumeration was performed by upwards of 100,000 pupils in the public schools of the state, and was conducted under the supervision of district superintendents, principals, and teachers.

The statistics most desired were certain data relating to the live-stock industry of the state, which included horses, cattle, sheep, swine, and poultry on hand January 1, 1916; also, for the preceding year, the quantity of cereals produced, and the amount of hay and forage, the number of silos, the number of bushels of apples, potatoes, beans, onions, and of tons of cabbage — a total of thirty-two items. Information was much desired along other lines of agricultural production, but the items named included as much as it was thought possible for the children to collect with any large degree of accuracy.

The gathering of the information was entered into with enthusiasm by a very large proportion of the 10,500 public schools of the state. In many sections, however, the unusual amount of snow and cold weather of the winter season made the work difficult of accomplishment, and in some it was necessarily postponed until spring. A few districts failed to report at all, and in such cases an average was made with other districts of the town for which statistics had been received, investigation showing that such

averages would be practically correct. No attempt was made to collect the information in the cities of the state, but in making up the totals the figures of the Federal Census covering cities were introduced in so far as they applied to this work.

In making the enumeration it was assumed that horses over three years of age should be classed as "mature"; those under that age as "colts." The number reported shows a small gain over the number on hand June 1, 1910.*

The total of sheep and lambs indicates that there has been a constant shrinkage in number of animals since the year 1910. Swine have varied but little, but show a slight increase. In poultry, there is a very important increase.

In dairy cows the number varies but little from the 1910 Federal total for New York of 1,509,594, which includes as "mature" animals those of two years of age and over, on June 1, 1910.

The number of calves raised in 1915 shows a decrease of 94,547, and the number of "all cattle" in the state is 335,208 less than in 1910. This decrease may be attributed largely to the very high prices of meat products prevailing, and also to the fact that prices of stock feeds were too high to allow of cattle being fed for beef at a profit.

This was the first enumeration of silos made in the state. The item of ensilage has been heretofore included with "other forage." The average capacity of the silos in the state is shown to be about sixty tons each, and about one-fifth of the farms of the state have silos. In many counties the proportion of silos to dairy animals is much greater than in others, and this holds true in counties where the corn crop is raised with greater difficulty, and is more uncertain in production than in the others. The largest number of silos in any county is 2,763 in St. Lawrence; Jefferson with 2,362 stands second; Chautauqua third with 1,984; Oneida fourth with 1,954, while but two were reported from Hamilton County, 28 from Rockland, and 37 from Nassau.

* It is difficult to make a satisfactory comparison of numbers of livestock shown by this census and the Federal Census, since the latter shows numbers on hand for June 1, while the present census includes all on hand January 1.

Ensilage is largely taking the place of the ordinary field corn; it will be noted in substantiation of this fact that the number of bushels of corn raised for corn alone, is less than one-half the quantity shown by the previous census.

ENSILAGE

County	Tons	County	Tons
1. St. Lawrence.....	220,922	30. Monroe.....	36,129
2. Jefferson.....	178,486	31. Clinton.....	35,507
3. Oneida.....	125,696	32. Saratoga.....	32,618
4. Chautauqua.....	109,421	33. Livingston.....	31,917
5. Oswego.....	90,759	34. Tompkins.....	31,294
6. Erie.....	90,732	35. Rensselaer.....	30,385
7. Onondaga.....	88,980	36. Sullivan.....	27,227
8. Washington.....	85,353	37. Westchester.....	25,113
9. Delaware.....	82,441	38. Chemung.....	25,045
10. Wyoming.....	82,050	39. Columbia.....	24,457
11. Madison.....	78,400	40. Ulster.....	19,690
12. Dutchess.....	77,111	41. Ontario.....	18,878
13. Chenango.....	76,437	42. Putnam.....	18,842
14. Cattaraugus.....	70,899	43. Niagara.....	18,397
15. Otsego.....	67,205	44. Orleans.....	17,441
16. Herkimer.....	62,658	45. Albany.....	14,584
17. Cayuga.....	62,356	46. Fulton.....	14,381
18. Lewis.....	58,601	47. Suffolk.....	12,700
19. Steuben.....	57,425	48. Essex.....	12,156
20. Montgomery.....	53,136	49. Schenectady.....	9,476
21. Allegany.....	51,428	50. Warren.....	8,357
22. Franklin.....	50,294	51. Greene.....	8,187
23. Broome.....	49,789	52. Seneca.....	7,727
24. Wayne.....	46,495	53. Schuyler.....	4,327
25. Cortland.....	44,795	54. Yates.....	3,293
26. Orange.....	43,518	55. Rockland.....	2,074
27. Genesee.....	41,872	56. Nassau.....	1,725
28. Tioga.....	41,523	57. Hamilton.....	120
29. Schoharie.....	37,752		

But little change is noted in the quantity of hay produced, but alfalfa shows a remarkable increase both in acreage and in quantity produced—an increase in acreage of 104,091 acres, and in quantity of 205,367 tons. This indicates that the farmers of the state are learning to appreciate the great value of alfalfa as a stock food and that the results of the experiments made in producing this crop are being followed upon a large proportion of the farms of the state. The figures show that more or less alfalfa is being produced in all counties of the state, the leading ones being Onondaga and Madison—the former with 63,564 tons, and the latter, 33,108 tons. A remarkable increase is also shown in the production of red and alsike clover.

ALFALFA

County	Tons	County	Tons
1. Onondaga.....	63,564	30. Allegany.....	2,344
2. Madison.....	33,108	31. Oswego.....	2,142
3. Cayuga.....	19,762	32. Clinton.....	2,016
4. Oneida.....	16,500	33. Dutchess.....	1,929
5. Ontario.....	16,174	34. Albany.....	1,758
6. Monroe.....	13,776	35. Washington.....	1,752
7. Genesee.....	11,260	36. Niagara.....	1,539
8. Livingston.....	9,715	37. Essex.....	1,309
9. Orange.....	8,322	38. Columbia.....	1,256
10. Wayne.....	6,821	39. St. Lawrence.....	1,222
11. Erie.....	4,982	40. Chemung.....	1,084
12. Wyoming.....	4,704	41. Lewis.....	1,067
13. Yates.....	4,495	42. Westchester.....	1,019
14. Chenango.....	4,323	43. Schuyler.....	949
15. Schoharie.....	3,986	44. Saratoga.....	900
16. Cattaraugus.....	3,951	45. Greene.....	752
17. Tompkins.....	3,917	46. Sullivan.....	627
18. Seneca.....	3,699	47. Rensselaer.....	625
19. Steuben.....	3,287	48. Tioga.....	580
20. Ulster.....	3,069	49. Broome.....	560
21. Montgomery.....	3,025	50. Delaware.....	522
22. Chautauqua.....	3,022	51. Schenectady.....	510
23. Otsego.....	3,006	52. Warren.....	442
24. Jefferson.....	2,964	53. Putnam.....	307
25. Cortland.....	2,862	54. Nassau.....	290
26. Herkimer.....	2,849	55. Franklin.....	289
27. Fulton.....	2,469	56. Rockland.....	205
28. Orleans.....	2,413	57. Hamilton.....	2
29. Suffolk.....	2,387		

Wheat shows a considerable increase in number of bushels and also in the number of counties in which it is produced, practically all counties in the state being represented; this is also true of the bean crop of which large quantities are now being produced in counties where but few were formerly raised. The year 1915 was not a favorable year for potatoes, the crop being less than one-half that of 1909.

WHEAT

County	Bushels	County	Bushels
1. Monroe.....	1,012,984	16. Saratoga.....	140,683
2. Ontario.....	694,305	17. Schuyler.....	86,890
3. Niagara.....	673,088	18. Suffolk.....	66,492
4. Genesee.....	637,279	19. Madison.....	39,835
5. Orleans.....	635,197	20. Oneida.....	38,573
6. Livingston.....	556,421	21. Dutchess.....	33,770
7. Cayuga.....	498,626	22. Chemung.....	29,808
8. Wayne.....	467,070	23. Allegany.....	29,802
9. Erie.....	420,447	24. Orange.....	28,204
10. Seneca.....	388,675	25. Ulster.....	27,909
11. Wyoming.....	318,720	26. Montgomery.....	27,106
12. Yates.....	293,605	27. Jefferson.....	25,881
13. Onondaga.....	259,866	28. Chautauqua.....	25,523
14. Steuben.....	169,177	29. St. Lawrence.....	23,055
15. Tompkins.....	159,260	30. Albany.....	22,467

WHEAT — (*Continued*).

County	Bushels	County	Bushels
31. Franklin.....	21,568	45. Westchester.....	5,424
32. Tioga.....	18,847	46. Schenectady.....	5,027
33. Clinton.....	17,782	47. Warren.....	4,858
34. Oswego.....	16,107	48. Rensselaer.....	4,719
35. Nassau.....	13,052	49. Herkimer.....	4,318
36. Schoharie.....	12,888	50. Essex.....	3,844
37. Cattaraugus.....	12,627	51. Fulton.....	2,331
38. Washington.....	9,694	52. Delaware.....	2,052
39. Greene.....	9,254	53. Lewis.....	1,957
40. Cortland.....	8,036	54. Sullivan.....	1,650
41. Columbia.....	7,509	55. Rockland.....	1,455
42. Otsego.....	6,373	56. Putnam.....	1,107
43. Chenango.....	5,943	57. Hamilton.....	95
44. Broome.....	5,589		

An examination of the figures upon the following pages will show by counties the result of this census, and will indicate where improvement can undoubtedly be made by the agricultural interests of the state. It is evident that the growth in agriculture is not keeping pace with the increase in population in this state.

CHARLES W. LARMON,

Chief, Bureau of Statistics, State Department of Agriculture

DAIRY COWS

County		County	
1. St. Lawrence.....	96,802	30. Sullivan.....	16,190
2. Delaware.....	73,440	31. Saratoga.....	14,920
3. Jefferson.....	58,959	32. Monroe.....	14,803
4. Oneida.....	54,184	33. Rensselaer.....	14,751
5. Cattaraugus.....	47,383	34. Tioga.....	14,433
6. Chenango.....	43,803	35. Columbia.....	13,898
7. Chautauqua.....	41,526	36. Greene.....	13,068
8. Otsego.....	39,566	37. Albany.....	12,707
9. Erie.....	37,302	38. Tompkins.....	12,695
10. Lewis.....	34,408	39. Genesee.....	11,830
11. Oswego.....	34,401	40. Livingston.....	11,501
12. Orange.....	32,496	41. Ontario.....	10,959
13. Steuben.....	31,606	42. Niagara.....	10,647
14. Herkimer.....	30,858	43. Essex.....	9,680
15. Allegany.....	30,655	44. Chemung.....	9,186
16. Broome.....	27,582	45. Westchester.....	8,755
17. Onondaga.....	27,474	46. Putnam.....	8,701
18. Wyoming.....	26,406	47. Fulton.....	7,506
19. Madison.....	26,039	48. Suffolk.....	6,918
20. Dutchess.....	25,572	49. Orleans.....	6,311
21. Washington.....	25,323	50. Schuyler.....	5,140
22. Franklin.....	25,280	51. Schenectady.....	5,063
23. Clinton.....	24,509	52. Yates.....	5,035
24. Schoharie.....	22,063	53. Seneca.....	4,992
25. Cayuga.....	21,390	54. Warren.....	4,908
26. Cortland.....	20,947	55. Rockland.....	2,194
27. Montgomery.....	17,684	56. Nassau.....	1,693
28. Wayne.....	17,588	57. Hamilton.....	907
29. Ulster.....	16,199		

HORSES, SHEEP AND SWINE ON HAND JANUARY 1, 1916 — NEW YORK STATE — BY COUNTIES

COUNTY	Horses (over 3 years of age)	Colts (3 years and under)	Sheep (1 year old and over)	Lambs (under 1 year)	Swine
Albany	8,052	714	7,447	1,907	12,093
Allegany	10,073	1,909	8,765	2,628	9,980
Broome	8,004	917	4,366	1,107	6,042
Cattaraugus	10,383	1,604	3,303	1,132	13,125
Cayuga	12,564	1,711	6,930	2,597	16,928
Chautauqua	12,811	2,128	4,167	1,459	14,459
Chemung	4,130	531	3,234	907	3,791
Chenango	9,502	1,112	2,400	718	8,616
Clinton	8,896	2,473	6,070	2,075	10,672
Columbia	7,945	625	8,232	2,254	10,231
Cortland	5,309	622	1,446	524	3,930
Delaware	10,852	979	2,713	1,209	11,697
Dutchess	9,001	756	5,266	2,244	12,404
Erie	15,808	1,809	3,024	1,034	20,000
Essex	5,389	903	10,043	2,121	4,820
Franklin	6,808	1,587	2,430	815	8,749
Fulton	3,490	400	630	213	3,740
Genesee	8,957	1,209	14,201	15,445	11,301
Greene	4,920	400	4,073	1,270	6,949
Hamilton	584	52	974	633	440
Herkimer	7,031	659	955	304	6,652
Jefferson	14,844	2,249	4,272	1,224	18,635
Lewis	7,266	1,090	1,244	649	10,422
Livingston	8,490	1,561	22,529	9,810	10,701
Madison	7,789	955	1,899	829	7,910
Monroe	15,279	1,886	8,225	3,332	19,795
Montgomery	6,226	751	985	414	7,606
Nassau	3,858	214	250	122	3,369
Niagara	10,400	1,526	7,429	3,892	16,452
Oneida	14,047	1,426	3,495	1,324	16,349
Onondaga	13,241	1,381	5,789	2,141	16,590
Ontario	11,558	1,627	24,622	10,558	17,313
Orange	8,079	635	1,100	478	8,581
Orleans	8,652	1,191	22,040	10,949	13,124
Oswego	11,673	1,567	2,092	986	12,056
Otsego	10,562	1,024	6,232	2,017	11,266
Putnam	2,633	115	437	154	2,401
Queens . . . . .	.....	.....	.....	.....	103
Rensselaer	7,835	576	8,188	2,377	8,905
Rockland	2,434	89	295	204	2,364
St. Lawrence	19,739	3,792	7,299	3,061	27,120

HORSES, SHEEP AND SWINE ON HAND JANUARY 1, 1916 — NEW YORK STATE — BY COUNTIES — (*Continued*)

COUNTY	Horses (over 3 years of age)	Colts (3 years and under)	Sheep (1 year old and over)	Lambs (under 1 year)	Swine
Saratoga.....	7,584	766	4,775	1,185	9,581
Schenectady.....	2,857	396	1,082	397	4,646
Schoharie.....	6,306	622	4,262	1,142	7,311
Schuyler.....	4,372	486	10,900	3,807	5,218
Seneca.....	5,307	826	4,692	1,741	8,108
Steuben.....	15,435	2,339	19,768	9,440	16,283
Suffolk.....	9,581	522	2,917	976	10,170
Sullivan.....	5,697	558	507	708	5,800
Tioga.....	5,668	746	4,713	1,155	3,946
Tompkins.....	6,857	975	7,348	2,972	6,871
Ulster.....	8,515	622	2,581	1,416	11,377
Warren.....	2,988	412	6,244	2,054	3,250
Washington.....	9,227	1,333	13,262	4,043	10,832
Wayne.....	12,544	1,569	8,280	2,617	19,137
Westchester.....	4,752	240	1,111	447	5,603
Wyoming.....	10,036	1,572	9,954	6,705	11,972
Yates.....	5,718	797	17,952	7,049	18,076
Total on farms.....	478,558	61,536	349,439	144,971	585,759
Estimated number not on farms.	303,256	.....	26,131	.....	32,316
Grand total for state.....	781,814	61,536	375,570	144,971	618,075

DAIRY CATTLE ON HAND JANUARY 1, 1916 — NEW YORK
STATE — BY COUNTIES

COUNTY	Dairy cows (2 years and over)	Yearling heifers	Calves (raised in 1915)	All other cattle	All cattle, total
Albany.....	12,707	2,205	2,758	1,387	19,057
Allegany.....	30,655	7,545	9,432	3,143	50,775
Broome.....	27,582	7,242	7,971	2,050	44,845
Cattaraugus.....	47,383	10,766	13,556	4,562	76,267
Cayuga.....	21,390	4,834	5,632	2,141	33,997
Chautauqua.....	41,526	10,463	12,920	4,500	69,409
Chemung.....	9,186	2,453	2,777	982	15,398
Chenango.....	43,803	11,152	11,327	3,309	69,591
Clinton.....	24,509	5,760	8,293	2,590	41,152
Columbia.....	13,898	3,239	3,156	1,308	21,601
Cortland.....	20,947	5,649	5,687	2,513	34,796
Delaware.....	73,440	15,715	16,943	5,660	111,758
Dutchess.....	25,572	6,529	5,947	2,908	40,956
Erie.....	37,302	7,896	7,725	4,659	57,582
Essex.....	9,680	2,450	3,713	1,250	17,093
Franklin.....	25,280	5,227	9,026	2,439	41,972
Fulton.....	7,506	1,845	2,150	929	12,430
Genesee.....	11,830	2,538	2,942	2,558	19,868
Greene.....	13,068	2,828	3,944	1,194	21,034
Hamilton.....	907	273	386	155	1,721
Herkimer.....	30,858	5,747	6,341	2,713	45,659
Jefferson.....	58,959	12,070	15,517	4,630	91,176
Lewis.....	34,408	7,368	8,815	2,649	53,240
Livingston.....	11,501	2,885	3,199	2,878	20,463
Madison.....	26,039	7,623	7,391	2,154	43,207
Monroe.....	14,803	3,259	3,496	3,282	24,840
Montgomery.....	17,684	3,437	3,896	1,548	26,565
Nassau.....	1,693	310	240	137	2,380
Niagara.....	10,647	2,686	2,942	1,629	17,904
Oneida.....	54,184	12,077	12,523	4,262	83,046
Onondaga.....	27,474	7,465	8,080	2,890	45,909
Ontario.....	10,959	2,996	3,725	2,700	20,380
Orange.....	32,496	6,111	4,963	2,401	45,971
Orleans.....	6,311	1,620	2,048	1,860	11,839
Oswego.....	34,401	7,779	9,319	3,882	55,381
Otsego.....	39,566	10,032	11,359	3,418	64,375
Putnam.....	8,701	2,143	1,711	704	13,259
Rensselaer.....	14,751	3,133	3,786	1,445	23,115
Rockland.....	2,194	500	660	311	3,665
St. Lawrence.....	96,802	18,739	28,465	7,568	151,574
Saratoga.....	14,920	3,211	3,791	1,932	23,854
Schenectady.....	5,063	898	1,081	612	7,654
Schoharie.....	22,063	4,888	6,288	1,983	35,222
Schuyler.....	5,140	1,391	1,816	665	9,012
Seneca.....	4,992	1,318	1,681	976	8,967

DAIRY CATTLE ON HAND JANUARY 1, 1916—NEW YORK STATE—
BY COUNTIES — (*Continued*)

COUNTY	Dairy cows (2 years and over)	Yearling heifers	Calves (raised in 1915)	All other cattle	All cattle, total
Steuben.....	31,606	7,804	9,876	3,386	52,672
Suffolk.....	6,918	1,052	1,866	987	10,823
Sullivan.....	16,190	4,755	5,486	2,411	28,842
Tioga.....	14,433	4,311	4,514	1,346	24,604
Tompkins.....	12,695	3,512	3,861	1,310	21,378
Ulster.....	16,199	4,949	5,137	3,474	29,759
Warren.....	4,908	1,285	2,144	741	9,078
Washington.....	25,323	5,588	6,010	2,264	39,185
Wayne.....	17,588	3,306	3,869	2,300	27,063
Westchester.....	8,755	2,064	1,892	742	13,453
Wyoming.....	26,406	6,054	7,501	2,721	42,682
Yates.....	5,035	1,493	2,208	2,053	10,789
Total on farms.....	1,270,836	292,468	343,782	133,201	2,040,287
Estimated number not on farms.....	32,225	.....	.....	15,283	47,508
Grand total for state.....	1,303,061	292,468	343,782	148,484	2,087,795

POULTRY ON HAND JANUARY 1, 1916 — NEW YORK STATE —
BY COUNTIES

COUNTY	NUMBER POULTRY			
	Chickens	Turkeys	Geese	Ducks
Albany.....	254,746	1,698	1,286	3,953
Allegany.....	200,329	3,303	597	5,091
Broome.....	189,206	918	458	3,844
Cattaraugus.....	248,468	3,929	694	4,415
Cayuga.....	346,680	3,895	1,574	8,202
Chautauqua.....	377,779	2,527	1,227	6,150
Chemung.....	103,725	286	391	2,124
Chenango.....	335,793	3,562	445	4,856
Clinton.....	134,938	4,744	814	1,363
Columbia.....	201,748	2,257	1,013	3,983
Cortland.....	141,067	1,358	354	2,589
Delaware.....	318,214	4,706	562	6,683
Dutchess.....	282,518	4,077	853	5,764
Erie.....	394,040	1,929	3,704	10,731
Essex.....	83,564	1,319	355	829
Franklin.....	109,494	3,028	537	1,856
Fulton.....	86,618	768	328	2,642
Genesee.....	142,511	2,765	880	3,479
Greene.....	149,037	967	315	2,187
Hamilton.....	11,694	158	17	92
Herkimer.....	157,251	2,358	406	2,394
Jefferson.....	256,668	11,674	932	3,836
Lewis.....	112,033	3,282	410	931
Livingston.....	153,660	3,295	728	7,720
Madison.....	180,947	2,294	601	4,074
Monroe.....	334,099	3,284	2,810	6,148
Montgomery.....	149,523	1,536	614	2,247
Nassau.....	230,305	994	1,686	7,937
Niagara.....	237,589	2,003	2,016	12,085
Oneida.....	310,040	6,073	1,545	5,503
Onondaga.....	318,380	3,166	2,948	14,192
Ontario.....	253,274	1,946	1,320	4,156
Orange.....	290,895	2,023	1,057	5,919
Orleans.....	144,910	1,812	947	2,866
Oswego.....	298,542	5,210	1,209	5,987
Otsego.....	403,621	4,766	674	5,833
Putnam.....	86,628	435	254	1,231
Rensselaer.....	252,516	1,807	1,025	3,815
Rockland.....	128,186	201	903	2,464
St. Lawrence.....	399,023	27,371	2,431	4,741
Saratoga.....	244,293	2,337	852	2,566
Schenectady.....	89,645	700	620	1,045
Schoharie.....	221,488	2,793	553	3,125
Schuyler.....	98,001	1,248	214	1,626
Seneca.....	119,130	710	738	3,051

POULTRY ON HAND JANUARY 1, 1916 — NEW YORK STATE —
BY COUNTIES — (*Continued*)

COUNTY	NUMBER POULTRY			
	Chickens	Turkeys	Geese	Ducks
Steuben	328,014	4,881	1,347	6,703
Suffolk	488,391	973	4,048	116,323
Sullivan	265,806	1,563	616	4,108
Tioga	191,290	801	465	2,836
Tompkins	206,589	2,208	817	3,775
Ulster	377,766	2,252	1,227	6,559
Warren	82,409	2,081	131	506
Washington	221,634	3,109	632	2,227
Wayne	367,778	2,043	1,712	6,581
Westchester	217,981	623	1,209	4,804
Wyoming	192,394	4,377	892	3,055
Yates	133,996	1,321	521	2,202
Total on New York farms	12,656,664	167,753	57,514	356,004

ENSILAGE FOR YEAR PRECEDING JANUARY 1, 1916 — NEW YORK
STATE — BY COUNTIES

COUNTY	Silos (number)	Ensilage (tons)
Albany.....	207	14,584
Allegany.....	1,194	51,428
Broome.....	995	49,789
Cattaraugus.....	1,289	70,899
Cayuga.....	1,068	62,356
Chautauqua.....	1,984	109,421
Chemung.....	429	25,045
Chenango.....	1,426	76,437
Clinton.....	474	35,507
Columbia.....	276	24,457
Cortland.....	691	44,795
Delaware.....	1,661	82,441
Dutchess.....	829	77,111
Erie.....	1,774	90,732
Essex.....	229	12,156
Franklin.....	625	50,294
Fulton.....	247	14,381
Genesee.....	646	41,872
Greene.....	167	8,187
Hamilton.....	2	120
Herkimer.....	1,245	62,658
Jefferson.....	2,362	178,486
Lewis.....	829	58,601
Livingston.....	470	31,917
Madison.....	1,340	78,400
Monroe.....	492	36,129
Montgomery.....	777	53,136
Nassau.....	37	1,725
Niagara.....	263	18,397
Oneida.....	1,954	125,696
Onondaga.....	1,243	88,980
Ontario.....	282	18,878
Orange.....	540	43,518
Orleans.....	309	17,441
Oswego.....	1,600	90,759
Otsego.....	1,511	67,205
Putnam.....	196	18,842
Rensselaer.....	458	30,385
Rockland.....	28	2,074
St. Lawrence.....	2,763	220,922
Saratoga.....	601	32,618
Schenectady.....	111	9,476
Schoharie.....	648	37,752
Schuyler.....	127	4,327
Seneca.....	182	7,727

ENSILAGE FOR YEAR PRECEDING JANUARY 1, 1916 — NEW YORK
STATE — BY COUNTIES — (*Continued*)

COUNTY	Silos (number)	Ensilage (tons)
Steuben.....	1,207	57,425
Suffolk.....	126	12,700
Sullivan.....	451	27,227
Tioga.....	792	41,523
Tompkins.....	582	31,294
Ulster.....	274	19,690
Warren.....	111	8,357
Washington.....	1,185	85,353
Wayne.....	762	46,495
Westchester.....	245	25,113
Wyoming.....	1,251	82,050
Yates.....	62	3,293
Total on New York farms.....	43,629	2,718,581

ENSILAGE FOR YEAR PRECEDING JANUARY 1, 1916 — NEW YORK
STATE — BY COUNTIES

COUNTY	Hay (tons)	Alfalfa (tons)	Alfalfa (acres)	Red clover (tons)	Other forage (tons)
Albany.....	116,140	1,758	1,360	6,595	14,028
Allegany.....	99,640	2,344	913	8,141	26,990
Broome.....	77,793	560	239	6,213	12,043
Cattaraugus.....	135,676	3,951	1,304	5,897	30,589
Cayuga.....	84,888	19,762	9,247	13,626	19,324
Chautauqua.....	123,916	3,022	901	6,530	29,821
Chemung.....	25,970	1,084	397	4,279	4,908
Chenango.....	129,356	4,323	727	7,977	13,271
Clinton.....	62,597	2,016	2,151	2,730	24,154
Columbia.....	45,864	1,256	530	4,760	13,687
Cortland.....	69,681	2,862	1,288	12,018	9,263
Delaware.....	165,461	522	166	12,314	19,719
Dutchess.....	62,761	1,929	1,384	5,164	13,914
Erie.....	108,631	4,982	2,377	10,726	22,452
Essex.....	32,009	1,309	1,588	1,889	9,070
Franklin.....	60,951	289	801	5,948	21,067
Fulton.....	28,153	2,469	266	2,690	6,297
Genesee.....	34,492	11,260	4,506	6,822	16,759
Greene.....	32,187	752	639	1,368	9,076
Hamilton.....	4,004	2	2	121	307
Herkimer.....	86,119	2,849	1,469	5,727	21,504
Jefferson.....	145,695	2,964	1,846	18,268	36,817
Lewis.....	108,975	1,067	1,114	5,329	15,731
Livingston.....	45,500	9,715	4,215	8,632	17,596
Madison.....	78,260	33,108	14,314	8,367	9,712
Monroe.....	46,217	13,776	5,657	4,846	28,588
Montgomery.....	52,192	3,025	1,759	10,316	28,302
Nassau.....	4,074	290	366	261	1,692
Niagara.....	43,715	1,539	987	7,497	28,322
Oneida.....	145,710	16,500	7,167	10,227	23,012
Onondaga.....	92,759	63,564	25,741	14,213	42,627
Ontario.....	590,498	16,174	9,050	9,783	17,545
Orange.....	76,214	8,322	2,225	2,880	11,090
Orleans.....	27,319	2,413	1,244	3,834	20,569
Oswego.....	73,652	2,142	884	6,002	29,668
Otsego.....	114,960	3,006	1,569	12,642	33,750
Putnam.....	20,904	307	104	589	1,652
Rensselaer.....	32,196	625	867	5,361	12,654
Rockland.....	7,938	205	125	458	2,407
St. Lawrence.....	215,428	1,222	3,124	33,195	87,539
Saratoga.....	49,592	900	925	6,599	15,212
Schenectady.....	18,174	510	214	4,270	5,636
Schoharie.....	71,351	3,986	1,965	9,487	21,122
Schuyler.....	34,396	949	644	6,106	8,628
Seneca.....	34,269	3,699	2,150	6,517	7,917

ENSILAGE FOR YEAR PRECEDING JANUARY 1, 1916 — NEW YORK
STATE — BY COUNTIES — (*Continued*)

COUNTY	Hay (tons)	Alfalfa (tons)	Alfalfa (acres)	Red clover (tons)	Other forage (tons)
Steuben.....	126,503	3,287	2,030	14,890	25,147
Suffolk.....	25,218	2,387	674	1,088	10,615
Sullivan.....	37,366	627	727	1,627	6,246
Tioga.....	40,448	580	252	4,682	8,032
Tompkins.....	60,389	3,917	2,967	11,457	13,417
Ulster.....	47,257	3,069	977	3,380	16,596
Warren.....	16,986	442	987	727	3,736
Washington.....	64,415	1,752	845	9,799	26,600
Wayne.....	45,872	6,821	4,141	5,918	31,565
Westchester.....	22,352	1,019	504	932	3,373
Wyoming.....	77,920	4,704	2,572	8,532	18,938
Yates.....	38,758	4,495	2,243	8,795	8,751
Total on New York farms..	4,319,761	292,409	139,430	398,941	985,297

OATS, CORN, AND WHEAT FOR YEAR PRECEDING JANUARY 1,
1916 — NEW YORK STATE — BY COUNTIES

COUNTY	Oats (bushels)	Corn (shelled) (bushels)	Wheat (bushels)
Albany	564,259	102,638	22,467
Allegany	1,108,097	18,342	29,802
Broome	397,077	20,500	5,589
Cattaraugus	1,022,264	47,404	12,627
Cayuga	1,096,945	431,341	498,626
Chautauqua	918,706	104,995	25,523
Chemung	242,629	28,088	29,808
Chenango	480,100	36,397	5,943
Clinton	768,640	117,378	17,782
Columbia	458,785	190,368	7,509
Cortland	378,098	17,350	8,036
Delaware	488,570	12,637	2,052
Dutchess	489,162	267,515	33,770
Erie	1,321,243	298,320	420,447
Essex	268,318	67,127	3,844
Franklin	908,910	59,334	21,568
Fulton	301,602	39,706	2,331
Genesee	515,396	200,102	637,279
Greene	197,702	100,267	9,254
Hamilton	12,235	1,387	95
Herkimer	508,680	49,842	4,318
Jefferson	2,858,316	111,817	25,881
Lewis	867,423	12,070	1,957
Livingston	703,537	185,628	556,421
Madison	534,837	59,682	39,835
Monroe	1,250,976	511,118	1,012,984
Montgomery	682,109	116,786	27,106
Nassau	10,653	80,644	13,052
Niagara	814,055	383,727	673,088
Oneida	829,745	97,461	38,573
Onondaga	863,835	308,903	259,866
Ontario	979,354	434,909	694,305
Orange	154,369	219,223	28,204
Orleans	534,853	234,268	635,197
Oswego	771,640	205,162	16,107
Otsego	853,523	52,986	6,373
Putnam	32,077	39,189	1,107
Rensselaer	439,359	154,917	4,719
Rockland	18,064	27,024	1,455
St. Lawrence	2,478,798	141,604	23,055
Saratoga	536,754	199,683	140,683
Schenectady	278,450	37,392	5,027
Schoharie	600,617	63,808	12,888
Schuyler	285,635	66,358	86,890
Seneca	515,303	210,289	388,675

OATS, CORN, AND WHEAT FOR YEAR PRECEDING JANUARY 1,
1916 — NEW YORK STATE — BY COUNTIES — (*Continued*)

COUNTY	Oats (bushels)	Corn (shelled) (bushels)	Wheat (bushels)
Steuben.....	1,544,471	117,405	169,177
Suffolk.....	74,069	415,541	66,492
Sullivan.....	191,222	59,627	1,650
Tioga.....	410,357	25,167	18,847
Tompkins.....	544,315	96,301	159,260
Ulster.....	247,524	195,234	27,909
Warren.....	52,327	46,738	4,858
Washington.....	727,875	408,248	9,694
Wayne.....	1,075,238	532,536	467,070
Westchester.....	49,814	71,243	5,424
Wyoming.....	992,257	32,817	318,720
Yates.....	358,077	189,460	293,605
Total on New York farms.....	36,609,246	8,356,003	8,034,824

BARLEY, RYE AND BUCKWHEAT FOR YEAR PRECEDING JANUARY
1, 1916 — NEW YORK STATE — BY COUNTIES

COUNTY	Barley (bushels)	Rye (bushels)	Buckwheat (bushels)
Albany.....	12,303	135,790	147,713
Allegany.....	87,910	6,636	112,451
Broome.....	2,135	9,778	58,543
Cattaraugus.....	17,855	4,427	121,703
Cayuga.....	288,077	18,522	208,400
Chautauqua.....	26,992	7,235	110,719
Chemung.....	16,078	29,971	75,812
Chenango.....	8,385	2,316	46,354
Clinton.....	44,520	5,083	50,385
Columbia.....	3,707	238,445	61,420
Cortland.....	20,281	2,003	40,436
Delaware.....	4,998	5,214	75,586
Dutchess.....	2,614	61,760	86,468
Erie.....	3,372	45,164	130,892
Essex.....	10,210	1,883	20,116
Franklin.....	54,883	12,064	24,265
Fulton.....	3,697	4,714	21,501
Genesee.....	74,231	30,285	11,796
Greene.....	1,725	51,851	55,885
Hamilton.....	25	162	1,197
Herkimer.....	22,116	2,414	13,425
Jefferson.....	69,460	3,913	23,499
Lewis.....	17,771	1,183	7,077
Livingston.....	79,012	47,981	33,452
Madison.....	64,808	2,699	39,815
Monroe.....	114,972	80,884	19,962
Montgomery.....	26,941	5,931	101,494
Nassau.....	1,525	11,060	1,192
Niagara.....	60,312	25,821	24,797
Oneida.....	40,669	6,859	27,604
Onondaga.....	168,578	15,445	40,223
Ontario.....	206,961	42,996	24,145
Orange.....	1,017	43,185	14,774
Orleans.....	95,096	15,904	13,550
Oswego.....	14,132	14,841	65,247
Otsego.....	19,727	5,272	86,483
Putnam.....	25	4,250	3,362
Rensselaer.....	4,659	177,403	53,102
Rockland.....	278	6,353	1,740
St. Lawrence.....	75,772	5,911	28,392
Saratoga.....	3,890	90,058	58,296
Schenectady.....	5,692	37,125	68,537
Schoharie.....	23,617	33,287	143,998
Schuyler.....	41,363	29,576	68,763
Seneca.....	51,191	10,650	60,474

BARLEY, RYE AND BUCKWHEAT FOR YEAR PRECEDING JANUARY
1, 1916 — NEW YORK STATE — BY COUNTIES — (*Continued*)

COUNTY	Barley (bushels)	Rye (bushels)	Buckwheat (bushels)
Steuben.....	129,451	62,336	195,846
Suffolk.....	2,173	26,826	11,448
Sullivan.....	305	22,972	38,693
Tioga.....	10,012	13,992	124,742
Tompkins.....	71,560	16,970	107,820
Ulster.....	2,111	65,596	56,536
Warren.....	354	2,933	15,810
Washington.....	8,395	71,605	42,001
Wayne.....	82,915	34,129	47,207
Westchester.....	572	13,780	3,425
Wyoming.....	60,707	11,301	87,192
Yates.....	76,757	36,728	26,397
Total on New York Farms.....	2,338,894	1,773,472	3,247,162

MISCELLANEOUS CROPS FOR YEAR PRECEDING JANUARY 1, 1916
— NEW YORK STATE — BY COUNTIES

COUNTY	Apples (bushels)	Potatoes (bushels)	Dry beans (bushels)	Onions (bushels)	Cabbage (tons)
Albany	307,388	107,574	4,428	17,314	5,141
Allegany	28,741	351,697	28,012	2,503	896
Broome	46,739	218,631	797	5,803	2,684
Cattaraugus	30,101	235,003	2,363	4,693	3,627
Cayuga	491,469	302,774	15,314	34,160	23,989
Chautauqua	155,817	291,844	3,560	36,872	5,067
Chemung	45,019	102,371	4,782	4,744	668
Chenango	45,051	233,860	1,508	1,733	5,556
Clinton	58,946	818,532	18,880	10,367	2,837
Columbia	827,802	153,773	5,172	9,102	3,641
Cortland	40,308	210,326	1,619	1,011	17,228
Delaware	98,226	229,284	1,214	1,131	680
Dutchess	616,612	191,131	1,198	10,677	2,024
Erie	69,625	906,468	50,352	46,269	10,854
Essex	42,490	214,081	6,678	5,278	1,367
Franklin	8,991	786,329	8,195	5,026	911
Fulton	43,935	119,121	1,282	2,419	1,753
Genesee	210,168	463,040	311,831	11,808	9,641
Greene	406,957	82,425	2,323	4,566	959
Hamilton	2,240	21,913	139	150	37
Herkimer	52,336	161,310	1,567	6,134	2,243
Jefferson	54,418	329,253	21,759	9,221	2,219
Lewis	18,540	254,802	3,172	5,967	1,861
Livingston	95,196	387,495	229,845	47,653	14,884
Madison	93,653	139,708	3,779	424,333	5,421
Monroe	1,655,702	1,066,657	14,429	54,077	74,006
Montgomery	92,526	88,210	4,019	5,088	1,313
Nassau	23,126	596,666	7,272	3,341	13,133
Niagara	1,041,384	202,166	50,245	680,546	17,585
Oneida	110,928	438,836	5,931	12,013	4,933
Onondaga	241,755	592,675	10,420	60,012	48,097
Ontario	1,216,434	542,780	112,655	24,352	82,033
Orange	257,900	182,370	2,909	858,630	2,804
Orleans	1,133,636	350,456	139,694	19,747	21,411
Oswego	207,908	381,465	9,752	69,348	20,086
Otsego	106,284	285,624	3,134	2,141	888
Putnam	61,771	49,725	340	2,994	332
Rensselaer	166,598	468,022	4,159	13,009	4,890
Rockland	68,989	42,448	518	2,850	1,510
St. Lawrence	30,049	568,636	10,009	13,829	3,242
Saratoga	173,413	259,364	3,904	21,084	1,636
Schenectady	54,782	31,548	2,484	4,332	1,030
Schoharie	163,412	126,745	3,731	2,661	297
Schuyler	115,229	80,079	52,859	2,981	109
Seneca	336,167	74,858	31,089	19,892	5,591

MISCELLANEOUS CROPS FOR YEAR PRECEDING JANUARY 1, 1916
— NEW YORK STATE — BY COUNTIES — (*Continued*)

COUNTY	Apples (bushels)	Potatoes (bushels)	Dry beans (bushels)	Onions (bushels)	Cabbage (tons)
Steuben.....	100,499	762,828	27,012	13,830	1,331
Suffolk.....	50,686	3,110,136	9,086	17,754	11,214
Sullivan.....	93,475	118,382	1,361	1,448	583
Tioga.....	52,689	165,069	2,924	1,939	579
Tompkins.....	117,536	138,734	24,402	4,306	3,536
Ulster.....	475,998	165,225	4,513	31,372	3,551
Warren.....	46,723	109,451	2,529	3,673	1,695
Washington.....	139,578	609,758	7,255	8,077	785
Wayne.....	3,036,162	391,695	101,907	543,099	42,808
Westchester.....	169,785	104,555	2,202	5,339	1,966
Wyoming.....	205,294	580,138	211,540	11,911	3,634
Yates.....	435,476	71,397	60,723	2,361	9,241
Total on New York farms.....	16,956,662	20,069,443	1,654,776	3,226,970	512,037

PLAN OF TAKING THE CENSUS

On February 1, 1916, plans for taking the census were put in operation. Blanks in duplicate to the number of 10,500 were sent out to all teachers in the rural schools, one to be filled in and returned to the Department, the other to be retained for future reference as a school record. A facsimile of the blank is shown on page 27.

At the same time the following detailed letter was sent out to district superintendents of schools:

STATE OF NEW YORK

DEPARTMENT OF AGRICULTURE

ALBANY, *February 1, 1916.*

To the District Superintendent of Schools:

DEAR SIR.—It is proposed to take a Farm Census of the domestic animals, forage, grain and other farm products of the state through the assistance of the public schools. The Education Department has kindly consented to cooperate with this Department in this work, and full instructions to the principals and teachers are given in the University Bulletin for February 1.

The data to be obtained through this census are of great importance to this department and to the state, and the work in collecting the same by the pupils of the public schools will be of considerable educational value to them.

Many farmers dislike to make public the details of their farming operations, fearing that such knowledge might affect the assessed value of their property and increase their taxes. We wish you would correct this impression as far as possible and would suggest it can be done through the teachers. We are making an effort through the public press to reach the farmers and assure them that they will not in any way be injured by giving the desired information.

The blanks are now being mailed to the schools with return postal cards to be signed by teachers, in order that a record may be kept of each district. If for any reason it is found impossible to secure the data, the teachers are requested to notify the district superintendent at once, and in case he is unable to suggest to the teacher a solution of the difficulty, he should immediately notify this department, in which case a representative of the department will be sent to the district to assist in the work.

STATE OF NEW YORK

FARM CENSUS OF LIVE STOCK AND CROPS, 1915

Department of Agriculture in co-operation with Education Department

CHARLES S. WILSON,
Commissioner of AgricultureDr. JOHN H. FINLEY,
Commissioner of Education

School Dist. No.....	P. O.....	Town.....	Co.....
Name of Principal or Teacher }	P. O.....	Town.....	Co.....
Name of Dist. Supt. of Schools }	P. O.....	Town.....	Co.....

(On hand Dec. 31, 1915)

(Produced during 1915)

Number Horses over 3 years of age.....	Tons Ensilage
Number Colts, 3 years and under.....	Tons Hay
Number Dairy Cows, 2 years and over....	Tons Alfalfa
Number Yearling Heifers.....	Acres Alfalfa
Number Calves raised in 1915.....	Tons Red Clover.....
Number All Other Cattle.....	Tons Other Forage.....
Number of All Cattle, total.....	Bushels Oats
Number Sheep, 1 year old and over.....	Bushels Corn (shelled).....
Number Lambs, under 1 year.....	Bushels Wheat
Number Swine	Bushels Barley
	Bushels Rye
	Bushels Buckwheat
Number Poultry { Chickens.....	Bushels Dry Beans.....
	Bushels Onions
	Bushels Potatoes
	Bushels Apples
Number Silos	Tons Cabbage

Names and addresses of owners of registered horses, cattle, sheep, hogs and poultry
— the number of each and breed:

Name	Address	Breed	No. Animals
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C. W. LARMON,
Statistician, Department of Agriculture

As soon as the data are secured, teachers are requested to forward the same to their district superintendent, and as soon as reports from all districts are received, he should forward them to this department by first-class mail. For this purpose we enclose a 10-cent postage stamp. The excess postage, if any, will be paid at this end of the line.

We are anxious to get this work completed as soon as possible and will thank you for your prompt attention to it.

Please address all communications to the Bureau of Statistics, Department of Agriculture, Albany, New York.

Yours truly,

CHARLES S. WILSON,
Commissioner of Agriculture.

Approved

JOHN H. FINLEY,
Commissioner of Education.

On the same day, was issued by the Education Department to all teachers, the University of the State of New York Bulletin to the Schools for February 1, 1916, containing a thorough explanation of the census and directions for making the enumeration. From time to time further notices were included in the bulletin, and these are reprinted in full below:

FEBRUARY 1, 1916

A FARM CENSUS TAKEN BY THE CHILDREN IN THE RURAL SCHOOLS

Abraham Lincoln said once, in an address before a state agricultural society: "No other human occupation opens so wide a field for the profitable and agreeable combination of labor with cultivated thought, as agriculture. I know nothing so pleasant to the mind as the discovery of anything that is at once new and valuable — nothing that so lightens and sweetens toil as the hopeful pursuit of such discovery. And how vast and how varied a field is agriculture for such discovery! The mind, already trained to thought in the country school, or higher school, can not fail to find there an exhaustless source of enjoyment. Every blade of grass is a study; and to produce two where there was but one is both a profit and a pleasure. And not grass alone, but soils, seeds, and seasons — hedges, ditches, and fences — draining, droughts,

and irrigation — plowing, hoeing, and harrowing — reaping, mowing, and threshing — saving crops, pests of crops, diseases of crops, and what will prevent or cure them — implements, utensils, and machines, their relative merits, and how to improve them — hogs, horses, and cattle — sheep, goats, and poultry — trees, shrubs, fruits, plants, and flowers — the thousand things of which these are specimens — each a world of study within itself.”

The children and their teachers in the schools of the state are to have an opportunity to give a special service to the state in making a census of the “exhaustless sources of enjoyment,” of “the thousand things” — “each a world of study within itself.” It is a service that will not interfere with the regular work of the school. Indeed, it should be indirectly helpful to every school, *but the value of it to the state will depend upon the cooperation of every school in districts where these things are to be found.*

The State Department of Agriculture has requested the cooperation of this department in making an enumeration or census of domestic live stock, the quantity of hay and grain, and, to a limited extent, of fruit and vegetables produced in the state during the year 1915. Such a census is considered desirable in order to show the agricultural resources of the state, the progress being made along agricultural lines, and as an indication to the various educational agencies, the sections of the state in which their activities are particularly needed.

A census of the United States has been taken for each ten-year period since 1790, at which time the population of the country was only 4,000,000, to that of 1910 when the population of the country had grown to a total of 93,402,151, an annual increase of 750,000 people. A state census is taken at the five-year period between each Federal Census, but does not include agricultural data. Such a census was taken in June last year and shows a population in the state of 9,687,458. The population of the cities, and a large proportion of the villages in the state, has been increasing much faster than that of the rural districts, and the state is becoming more and more dependent upon sources beyond its own limits for food products to supply the people. The rapid growth and development of the country makes it desirable to have accurate knowledge of all matter pertaining to agriculture, oftener than

the ten-year period provides, and it is hoped that the experiment of securing such information through the pupils of the public schools of the state will be so successful and so accurate that we can depend upon that source each year for the information desired along that line. Many of the states of the Union provide for taking such a census annually, but the work is performed by enumerators in the employ of the state, or other public officials.

Since the census of 1910, prices of practically all agricultural products, especially those of live stock, show a very material increase and the cost of living has increased at a corresponding rate. The information in relation to registered stock will indicate the sections where greater interest should be taken in raising better, and consequently more profitable, animals. It is also hoped that through the public schools, reports on the acreage and conditions of growing crops of grain, hay, fruit and vegetables may also be secured, from time to time, during the growing period, and as the boys and girls become better acquainted with, and more proficient in the work, information covering a wider range will be asked for. It will be interesting to the people of each school district to know the number of horses, cattle, sheep, swine, and poultry, and the quantity of produce raised in the district each year, and to note the increase and improvement from year to year.

Blanks similar to that shown in this issue of the bulletin (page 27) have been sent to every school.

DIRECTIONS FOR TAKING CENSUS

- 1 Copy on the blackboard the census blank printed here.
- 2 Have one representative of each farm family copy the blank and take it home to be filled out with the answers as nearly correct as possible.
- 3 When a farm family is not represented by children in school, appoint a committee of one or more pupils to secure the data from such family.
- 4 Take care to include all the farms in your school district.
- 5 In villages and the smaller cities of the state plan the work by streets, portions of streets, or blocks in order that no portion may be missed or duplicated.
- 6 Corporation limits of many cities and villages include farms and truck gardens. Take care that none of these is omitted.

7 The names of the owners of all the articles enumerated on the blank should be reported by the enumerator in order to check up the result carefully. Preserve these reports for reference.

8 As reports are made by the enumerators, enter them under the proper headings on the blackboard. When complete reports have been received, make footing and enter the totals upon the census blanks.

9 If there are portions of two or more counties in your district, make returns separately for each county as the county will be the unit in the complete report.

10. Fill out and forward the census blank to the district superintendent of schools by March 1, or as soon thereafter as possible.

11 Keep on file in the district a copy of the complete report. It will be interesting to know the changes occurring from year to year.

12 In case it is impossible to collect the data within a reasonable time, notify the district superintendent in order that some one may be designated to carry on the work.

13 Two blanks have been sent to each school. If they are needed, additional blanks may be secured from the State Department of Agriculture, at Albany.

MARCH 1, 1916

THE FARM CENSUS

A large number of school districts of the state have made very prompt response to the request for cooperation in obtaining a farm census of the state. Reports that have been received show painstaking care in collecting and reporting the information. The result so far is gratifying.

A few superintendents, principals, and teachers have written to ask if the farm census is supposed to cover villages and small cities. It is intended that the enumeration shall be made in these places. Where necessary, the Department of Agriculture will assist in making these enumerations.

The Commissioner of Agriculture assures superintendents, principals and teachers that they may make emphatic denial of any statement indicating that this census has anything whatever to do with the present or any future rate of taxation.

MAY 1, 1916

A PIECE OF GOOD WORK FOR THE STATE BY THE SCHOOL CHILDREN

This department has cooperated with the Department of Agriculture in the making of the farm census. The work in the main has been completed in the 10,500 schools, and it is hoped that the second week in May will see it finished. I have been greatly pleased that the boys and girls of the schools have tried to perform this specific service for the state, and am grateful to the superintendents, principals, and teachers for their part in it. It is particularly gratifying to hear from the Commissioner of Agriculture that what has been done by them has been well done.

JUNE 1, 1916

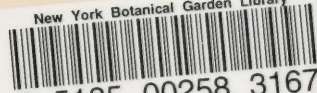
THE FARM CENSUS

Before the year closes I wish to report to the schools that the Commissioner of Agriculture regards the census when completed as the most valuable one of the kind ever taken in this state, covering as it does all the live stock of the state, crops raised during the past year, number and capacity of silos, and names and addresses of all owners of registered stock.

It is gratifying to be able to add that a representative of the United States Department of Agriculture recently examined the reports and was enthusiastic in his praise of the excellent work done by the public schools in this undertaking.

JOHN H. FINLEY.

New York Botanical Garden Library



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